

SPECIAL FEATURE

Hybrid
Recommendation-Based
Hotel Booking System



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Microgrid

A self-contained electrical network known as a microgrid integrates makes it possible to generate and use your own electricity whenever you need it. For this reason, the microgrid integrates and controls the Distributed Energy Resources (DER) while improving reliability, resilience, reduce grid congestion and peak loads. Microgrids work either in grid tied mode or in island mode. Microgrids respond when electricity prices rise or the grid goes down. A microgrid generates electricity on-site, in contrast to the utility grid, which generates electricity at a central power plant and then distributes it along hundreds of miles of transmission lines. For power outage, microgrids ordinarily utilize a mix of reinforcement diesel generators and renewables like photovoltaic system, fuel cells etc. Microgrids can integrate battery frameworks to store power and convey it during blackouts or instability.

In the event of natural disasters, extreme weather, or other disruptions to the grid, a microgrid can provide resilience. A microgrid can continue to provide power to critical loads even when the larger grid is down because it has its own generation and storage capabilities.

A real-time control system is required in a microgrid, where the local electrical network cannot rely on the external transmission network for operation. In addition to managing the black start (repowering the global system in the event of a blackout system) and providing grid services such as frequency and voltage support, a PMS (Power Management System) is able to calculate and apply an optimal power dispatch for assets in

order to guarantee the stability of the grid. The PMS can utilize input conjectures, like climate, to consider the impending working hours. The local controller receives operational planning from an energy management system (EMS) that can collect multiple forecasts and simulate future asset behaviour for the following days for more effective optimization. A local grid that is connected to the main grid on an ongoing or sporadic basis can also be referred to as a microgrid. When the microgrid is connected, control primarily consists of adhering to the constraints and characteristics of the connection point and transformer to maximize incoming while also supporting the main grid with ancillary services in the event of frequency or voltage deviation.

Microgrid in India was spearheaded in the 1990s by West Bengal Sustainable power Improvement Office (WBREDA) when it introduced a 25KW sun based PV framework in a Sundarban delta locale. A number of microgrid projects are going to be implemented in India. A green hydrogen fuel cell microgrid will be installed at an elevation of 3200 meters this year in Leh. BSES Yamuna Power Limited has dispatched four solar PV projects in east Delhi. In India, 63 solar microgrids have been put in place.

This significant benefit of such microgrids promises to give a dependable wellspring of power in regions with regular blackouts or unreliable grid framework.

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Hybrid Recommendation-Based Hotel Booking System

Abstract – The hotel industry has experienced tremendous growth over the years, making it essential to find the right hotel accommodations that meet the user's needs. To address this challenge, we propose a hybrid recommender system that recommends suitable hotel accommodations based on user preferences. Our Hybrid system utilizes features such as location, price, services, and customer ratings to analyze hotels and determine the most relevant recommendations for the user. By using this method, our system can provide personalized recommendations that take into account the user's past stays and preferences. The hotel recommendation and reservation system will be developed using ReactJS as the front-end technology and MongoDB as the back-end database. NodeJS, ExpressJS and Python will be used for the development of the application's back-end. The use of these technologies will ensure that the application is scalable and easily maintainable. The systems front-end will be user-friendly and intuitive, allowing users to search for hotels based on location, price range, services, and other factors. The system's back-end will be responsible for handling user authentication, hotel data storage, and other critical functionalities. In this work, a hybrid recommender module is developed using case based reasoning and XGBoost method. The hotel recommender module predicts the hotel based on location, customer rating, and price that would assist the customer to book the hotel. An invoice bill would be generated for booking the hotels. To validate the accuracy and effectiveness of this model, the recommendation results were compared with those produced by the existing datasets.

Keywords – Hybrid Recommender System, Reservation, Accommodation, Case-based reasoning.

I. Introduction

The hotel industry has experienced tremendous growth over the years, making it essential to find the right hotel accommodations that meet the user's needs. The traditional method of booking hotels by calling or visiting the hotel itself is now outdated and time-consuming. Nowadays, users prefer to make their bookings online due to its convenience, reliability, and time-saving nature. However, finding the right hotel that meets the user's needs can still be a challenge.

To address this challenge, a hybrid hotel recommendation system is proposed that recommends suitable hotel accommodations based on user preferences. The system will provide personalized recommendations that take into account the user's needs and preferences such as location, ratings and services. It will also simplify the booking process, helping users save time and effort. Using this system, our users can register, login, logout, search hotels, change preferences, get recommendations, and reserve accommodations.

The article is organized as follows. Section II outlines some existing literature. Section III defines the proposed methods. Section IV presents the obtained result. Section V delivers the conclusion points.

II. Literature Review

The study by Xu et al. [1] proposed a collaborative

filtering recommendation algorithm for hotel recommendations. Collaborative filtering is a common approach to recommendation systems that uses user data to predict what users might like based on what similar users have liked in the past. The study by Wang et al. [2] proposed a personalized hotel recommendation system that considers both the user's profile and rating behavior to provide recommendations. The study by Khusainov et al. [3] proposed a hybrid recommender system for hotel recommendations that combines content-based and collaborative filtering approaches. The system utilizes hotel attributes, such as location and amenities, as well as user ratings and similar users' ratings, to provide recommendations. The study by Khan et al. [4] proposed a context-aware hotel recommendation system using convolutional neural networks. The system takes into account the user's current context, such as their location and time of day, to provide personalized recommendations. The study proposed by Li et al. [5] a novel hotel recommendation system based on multi-objective optimization. The system uses multiple objectives to make hotel recommendations that are personalized to the user's needs.

The existing literature on hotel recommendation systems has limitations such as not considering the user's context and preferences or not taking into



account their implicit preferences. Therefore, this study aims to address these limitations by proposing a case-based reasoning approach for hotel recommendation and reservation that considers the user's context, preferences, and implicit feedback.

III. Methodology

The methodology used for the literature survey involved a comprehensive search of academic and industry-related databases, including Google Scholar, IEEE Xplore, ACM Digital Library, and Scopus. The search terms used for the survey included "hybrid recommender", "hotel recommendation", and "hospitality industry".

A. Development of the Front-End: The front-end of the system was developed using ReactJS. The user interface was designed using HTML, CSS, and JavaScript. The front-end was designed to be user-friendly and intuitive to use.

B. Development of the Back-End: The back-end of the system was developed using Node.js and Express.js. The back-end was responsible for processing user requests, interacting with the database, and generating responses.

C. Integration with MongoDB: The system was integrated with MongoDB, a NoSQL database, for data storage. MongoDB was chosen for its flexibility and scalability.

D. Data Set & Preprocessing: The Hotel Recommendation dataset [6] was obtained from Kaggle. Our first step was to clean and pre-process the data and perform exploratory analysis to get some interesting insights into the process of choosing a hotel. We used the chi-squared test to identify the most important features for predicting the rating of a property. Based on that we dropped the individual IDs of the hotels, rooms as well as the zip code column. We also cleared off the duplicate values and null values, transformed the hotel codes into hotel IDs. Using a geocoding api to retrieve the latitude and longitude of the given address we calculated the distance between the given location and all the hotels in the dataset that match the given city, and number of guests. The distances are added to new column dist. The remaining features were then used as input for the machine learning model. Table -1 describes the features of the proposed system.

Features	Description
Date Time	Timestamp
Hotel Code	Hotel ID
Hotel Name	Hotel name
Location	Address of the hotel
Dist	Physical distance between the user given address and the hotel address
Los	Length of Stay
Address	Hotel address
On site rate	Cheapest Price offered in
Room amenities	Amenities offered in the accommodation
Max occupancy	Maximum number of people allowed per room
Accommodation type	Type of the accommodation
Room type	Types of rooms available in a particular accommodation
Star rating	Average user ratings on the scale of 1-5
Rate description	Description of the room

Table – 1: Features of the Proposed System

E. Development of the Recommender System: A Case-based reasoning is used in this work [7]. It is a separate methodology for building recommendation systems that relies on using past experiences or cases to solve new problems. The recommendation is based on the cosine similarity between the vectors representing the user's input and the items in the dataset. We further applied XG Boost to boost the cosine similarity scores, distance matrix for more efficiency and accuracy. The system was designed to recommend hotels based on the cities. Another system was designed to recommend hotels based on the user's preferred amenities. Then a hybrid system was designed to merge both the previous systems to recommend the top-rated hotels of the user input city, having the most similar room amenities as the user's requirement. The recommender system was developed using Python and Pandas.

F. Case-based Reasoning (CBR): Case-based reasoning (CBR) is a problem-solving approach that involves using solutions to past problems to solve new problems that have similar characteristics. For example, an auto mechanic might solve a problem with an engine by recalling a similar issue they had previously encountered and resolved. Similarly, lawyers and judges use legal precedents to advocate

for specific outcomes in trials, while engineers may study elements of nature to create new solutions to problems.

G. Extreme Gradient Boost (XG Boost): XGBoost [8] is short for Extreme Gradient Boosting, which refers to using ensembles of weak learners to make a prediction. XGBoost is based on this model. It is used for supervised learning problems, where we use the training data (with multiple features) x_i to predict a target variable y_i . XGBoost is a machine learning technique that can handle missing data and automatically learn feature interactions, making it a powerful and flexible tool for a variety of applications. However, over fitting can occur if the hyperparameters are not tuned properly or if the data is noisy. XGBoost may also lack interpretability compared to other techniques. When optimizing the model, we focus on optimizing one level of the tree at a time instead of picking the best out of all trees, as it would be impractical. By calculating each feature's contribution for each tree in the model, the gain function displays the relative contribution of the associated feature to the model. When compared to another feature, a greater value for this metric indicates that it is more significant in terms of making predictions. In this work, customer rating and location are used as input parameters that predict the hotel based on customer search criteria.

H. Testing: The system was thoroughly tested to ensure that it met the requirements and was free of bugs and errors. The testing parameters for the recommender system is shown in Table-1. It is the final dataset after the exploratory analysis, cleaning the dataset and applying transformations.

Based on these parameters a function takes in a city name as input and returns the top 5 hotels in that city based on their rating. Another function calculates the number of guests that can be accommodated in each room based on the room type listed in the data. A requirement function is designated a city name, guest number, a set of amenities and returns a list of hotels in that city that match the given requirements. The final recommendation is based on the cosine similarity between the vectors representing the user's input and the items in the dataset. More specifically, the cosine similarity score is computed using the cosine similarity function from the pairwise module. The parameters on which the recommendation is being made depend on the user's chosen "preferred amenities" and "destination city". The function first

tokenizes the amenity features and then uses cosine similarity to match them with the features of the hotels in the given city and guest number.

Using the similarity score and distance as additional features, XGBoost is used as a regression model to predict another set of ratings of hotels based on their location, property type, room type, similarity score, minimum price, number of guests, ratings and distance from the user's location. Then the top 5 highest rated hotel are returned as output.

IV. Results Obtained

The hybrid hotel recommendation web application is implemented with the following hardware requirements for the system such as Intel Core i3 or equivalent processor, 4 GB or higher RAM, at least 5 GB storage space and Broadband Connection or Wifi. These specifications are sufficient to run the web application smoothly. The front-end of the system was developed using ReactJS. The user interface was designed using HTML, CSS, and JavaScript. The back-end of the system was developed using Node.js and Express.js. The system was integrated with MongoDB, a No SQL database for data storage. The Hybrid recommendation based Hotel booking system has been successfully developed, providing a one-stop solution for users looking for accommodations. The website consists of two main apps - the reservation/booking app, and the hotel recommendation app - which have been implemented using various tools and techniques.

The Home Page of the Hybrid Recommendation-Based Hotel Booking System as shown in Fig-1, consists of modules which include; the Recommendation module, the Search bar module. It also includes "Register", "Login" options. The Register page for the Hybrid Recommendation-Based Hotel Booking System allows new customers to register and create an account on the system. The Login page for the Hybrid Recommendation-Based Hotel Booking System allows customers to login into their account by providing their username and password. If the customer doesn't have an account, he/she create an account by clicking on "Register Now!"

Our Hybrid Recommendation-Based Hotel Booking System features a recommendation module on the homepage that provides customers with personalized



Fig. 1 Home page

hotel recommendations based on their unique needs and preferences. Customers can enter their destination city, address, necessary amenities, and the number of guests traveling with them. The system utilizes our algorithms to generate tailored recommendations quickly and easily, streamlining the booking process and enhancing the overall customer experience.

The recommended hotel can be obtained by giving the input value based on location, address and necessity as shown in Fig.2. Customers can get their personalized recommendations by providing certain information such as the city or destination they are travelling to, their address, their necessities such as free Wi-Fi, air conditioning, etc. and the no. of guests they will be travelling with. After filling out this information, the customer has to click on the submit button.

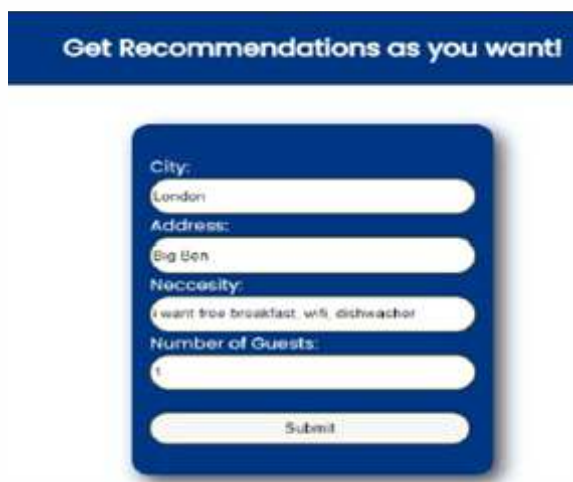


Fig. 2 Recommendation Page

The website has received positive feedback from users, who appreciate the convenience of having a centralized platform for hotel recommendations

customizable for their necessities as well as booking. After clicking on the “submit” button, customers will be directed to the recommendation page, which will display a list of hotels that match their preferences and requirements as shown in Fig. 3. The recommendation page will provide customers with detailed information about each hotel, including its name, distance from the city center, available room types, address, city, onsite rates, and maximum occupancy. Customers can use this information to compare hotels and choose the one that best meets their needs and budget. This would help customer to validate the distance of each hotel from the city center, compare the available room types, and check the maximum occupancy of each room.

	hotelname	distance	roomtype_x	address	city	onsiterate	maxoccupancy
0	Ventures Hotel	3.572850	Double	12-14 Sussex Gardens	london	104.54	2
9	Falcon Hotel	3.779419	Single Room	11 Norfolk Square	london	83.41	1
16	Premier Inn London Southwark - Tate Modern	1.699480	Double Room	15a Great Suffolk Street	london	141.50	2
84	The Beverley Hotel London - Victoria	1.514403	Deluxe Double Room	13 Belgrave Road	london	157.34	2
108	Wedgewood Hotel	4.905471	Double Room	49-51 Leinster Square	london	89.32	1

Fig. 3 Recommendation Result

The Hybrid recommendation-based Hotel booking system has been successful in achieving its goal of providing a one-stop solution for users looking for accommodations. The tools and techniques used have enabled us to efficiently collect and manage data, automate tasks, ensure the security of the website, and provide an intuitive and user-friendly interface. The website has the potential to contribute to the growth and development of the hospitality industry by providing enhanced customer experience, increased customer satisfaction, improved efficiency and better insights for decision making. Fig. 4 shows how the user input for the necessary amenities based recommender engine. Fig. 5 shows the recommended hotel along with its details as provided in the input criteria based on the XG boost based recommender model.

Requirements based: 'London', 1, 'I need an extra toilet and room should be completely air conditioned. I should have a bathroom.'

Fig. 4 User input

hotelname	roomtype	guests_no	starating	address	roomamenities	ratedescription	similarity	
310	The Colonnade London Hotel	Studio	1	4	2 Warrington Crescent	additional toilet,air conditioning,alarm clock...	Room size: 28 m ² /301 ft ² , Balcony/Terrace, Non...	4
819	Amba Hotel Charing Cross	Studio King Suite	1	4	The Strand	air conditioning,alarm clock,bathrobes,carpet...	Room size: 34 m ² /366 ft ² , Non-smoking, Shower...	3
793	Holiday Inn Express Park Royal	2 Single Beds Non-smoking	1	3	Victoria Road/Worth Acton	air conditioning,alarm clock,carpeting,closet...	Room size: 25 m ² /269 ft ² , Non-smoking, Shower...	3
816	Simply Rooms & Suites Hotel	Deluxe Studio Suite	1	4	21 Avonmore Road	additional toilet,air conditioning,cleaning pr...	Room size: 20 m ² /215 ft ² , City view, Non-smok...	3
912	The Cleveland Hotel	Single Room - Basic	1	4	39-40 Cleveland Square	air conditioning,carpeting,closet,clothes rack...	Room size: 14 m ² /151 ft ² , Non-smoking, Shower...	3

Fig. 5 Recommended hotel names based on input

The Search Page in Fig. 6 provides the users with a list of hotels that are available for their selected dates, with details such as hotel name, star rating, location, and room rates. They will be able to filter and sort the results based on their preferences, such as price range and amenities. Once they have found a hotel that meets their requirements, they can click on “See availability” to view more details about the hotel. After that it is simply a matter of choosing the preferred rooms and making the reservation. Once the booking is confirmed, an invoice is generated and downloaded to the user's local machine.

V. Conclusion

We have successfully implemented a hybrid recommendation-based hotel reservation system that can offer a highly personalized experience for users, leading to increased customer satisfaction and loyalty. By combining the strengths of different recommendation techniques, such as collaborative filtering and content-based filtering, the system can provide more accurate recommendations to users, even in situations where there is limited data or high variability in user preferences. However, there is still scope for further research in this area. Future studies could explore the use of advanced machine learning techniques, such as deep learning, to improve the accuracy of recommendations even further. Also the integration of context-aware recommendation systems could lead to more personalized and relevant recommendations based on the user's current situation. Overall, building a hybrid recommendation-based



Fig. 6. The Search page

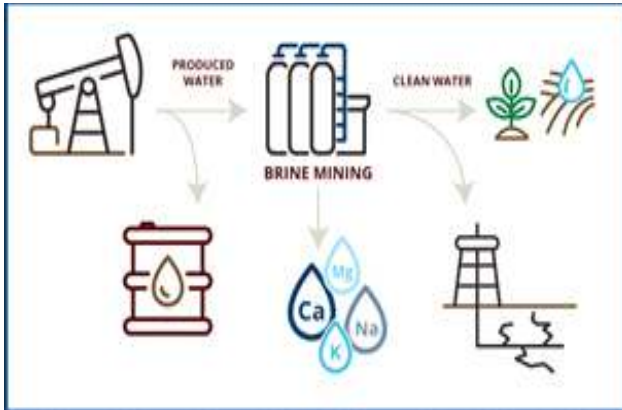
hotel reservation system can provide a competitive advantage for hotels and online booking platforms by offering a superior user experience and increasing customer retention.

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Hidden Minerals in Produced Water



Subsurface regions where geological processes occur, such as hydrocarbon reserves, produce an accumulation of water, which dissolves and retains enormous amounts of minerals and other elements. Six 42-gallon barrels of this "produced" water are typically recovered for every barrel of oil during oil and gas operations. After generated water is separated from oil, it is meant to be cleaned for use in certain agricultural operations or in hydraulic fracturing operations to recover further oil. This entails a brine mining process to recover essential minerals and other components.

(Source: SciTech Daily)

Farmers using satellite data from NASA, ESA, ISRO and others

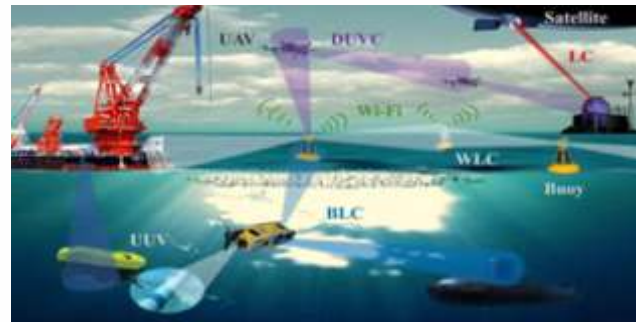


Drones and IoT hold immense potential to transform agriculture by providing farmers with crucial data to boost productivity. Open-source satellite data from institutions like NASA, ESA, ISRO, and others offer insights into soil quality, moisture content, and more. Earth observation satellites analyze soil samples

nationwide, using spectroscopic data to train machine learning algorithms for soil quality assessment. However, these technologies may be too expensive for small-scale farmers with less than two hectares of land.

(Source: The Indian Express)

All-Light Network Bridges Space, Air, and Sea



A seamless network of communication that is solely based by light enables connectivity in including space, the air, and underwater, has been developed by researchers. By integrating multiple light sources, this network facilitates uninterrupted, real-time data transmission across different mediums, enhancing communication, navigation, and data exchange capabilities. The researchers demonstrated the ability of the all-light communication network to transmit sensor data, pictures, and audio files via wired and wireless access, as well as full-duplex real-time video conversation. Full-duplex video enables simultaneous video transmission and reception, which is essential for uses like video conferences.

(Source: SciTech Daily)

Plasma-based Computer Programs could reduce the cost of microchips

Microchips enable the operation of automobiles and aircraft, improve appliances, and power cellphones. Researchers are now developing computer simulation programmes that will outperform current modelling techniques and enable the production of microchips using plasma, the electrically charged substance also used in fusion research. These codes could help increase manufacturing efficiency and perhaps even lead to a resurgence of the semiconductor industry in the United States.

(Source: Science Daily)

Four Astronauts Return to Earth after Six Months in Orbit



After spending six months in orbit, four astronauts from four different nations return to Earth. March 12, Cape Canaveral, Florida via Associated Press (AP) On Tuesday, SpaceX provided a ride down to Earth for four astronauts from four different nations, capping out a half-year stint at the International Space Station. Their capsule shot over the United States and landed in the Gulf of Mexico, close to the Florida Panhandle. Soon after it landed, support crews assembled around the SpaceX Dragon Endurance spacecraft. Leading the returning crew of Russia's Konstantin Borisov, Japan's Satoshi Furukawa, and Denmark's Andreas Mogensen was NASA's Jasmin Moghbeli, a Marine helicopter pilot.

(Source: News and Sentinel)

DNA as DATA Centre



In the age of big data, more data centers are essential, but traditional ones are unsustainable due to their high energy consumption. Storing information in Desoxyribonucleic Acid (DNA) offers a promising solution. DNA can potentially be vastly more compact, reliable, and robust compared to conventional memory devices. Researchers propose representing numbers as concentrations of manipulated DNA molecules, enabling computing operations like addition and multiplication. This approach integrates storage and computation, with DNA acting as the computational medium, bridging the gap between conventional silicon-based computing and DNA-based storage.

(Source: The Indian Express)

Reels and Influencers Key Drivers for Mobile Game Discovery in India



Artificial Intelligence (AI), Virtual reality (VR), and Augmented Reality (AR) are the most popular gaming technologies for casual players nationwide. Gaming is a top vertical globally for Meta, with their Advantage+ suite of automated ads drive growth for gaming brands. Meta serves as a leading resource for players to discover and purchase new games, as highlighted by a Global Wellness Institute (GWI) survey commissioned by the company. The survey reveals that six out of ten smartphone users play games daily, with gaming's popularity increasing, especially during significant athletic events and holiday seasons.

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Load Shedding by Smart Inverters

Abstract – Load shedding is a deliberate and controlled process of reducing the electricity load on a power system when the demand for electricity exceeds the available supply. By shedding or reducing the load on the system, it becomes possible to maintain system stability and avoid overloading, which could lead to power outages and damage to electrical equipment. Inverters with backup batteries are indeed an affordable and convenient solution for backup power, especially in areas that experience frequent power outages. In addition, parallel connection of inverter modules is an effective solution to increase the reliability, efficiency, and redundancy of inverters in a Micro-Grid system. However, proper load sharing among parallel inverters is crucial to avoid circulating currents that can significantly reduce the efficiency and stability of the system. In this work, a control strategy for improving the load sharing performance in order to reduce the circulating current among parallel inverters in islanding microgrids will be proposed. Here we will design a smart inverter which sheds the load according to battery power.

Keywords – Power distribution, microgrids, load shedding, smart inverters, power consumption, battery percentage.

I. Introduction

Smart inverter load shedding is a key function of modern power systems that helps to maintain system stability and avoid overloading during times of high demand or unexpected events. Load shedding refers to the deliberate and controlled reduction of electricity load on a power system when the demand for electricity exceeds the available supply. By shedding or reducing the load on the system, it becomes possible to maintain system stability and avoid overloading, which could lead to power outages and damage to electrical equipment. Smart inverters, which can communicate with other devices and exchanging information, are becoming increasingly important in modernizing the power grid and integrating distributed energy resources (DERs) such as solar photovoltaics (PV) and battery storage systems. Smart inverters can operate in either a decentralized or centralized manner and can make load shedding decisions based on their local measurements of power and voltage, or on signals from a central control system [1,2]. Load shedding is particularly important in micro-grids, which are small-scale power systems that can operate independently or in parallel with the main grid. Micro-grids often incorporate renewable energy sources and energy storage systems and can be used to provide reliable and resilient power to remote or off-grid communities. Smart inverter load shedding can help to maintain system stability and avoid overloading in micro-grids, while also ensuring that critical loads such as hospitals, emergency services, and water treatment plants remain powered during times of high demand or unexpected events.

In this context, the purpose of this project is to investigate the effectiveness of smart inverter load shedding schemes for maintaining system stability and avoiding overloading in micro-grids. The project will consider both decentralized and centralized control strategies and will examine the impact of load shedding on system performance and energy efficiency. The goal is to develop optimized load shedding schemes that can be used in different types of micro-grids, and that can integrate smart inverters with other DERs to further improve system performance.

II. Load Shedding

Load shedding is a controlled process of reducing the electricity load on a power system when the demand for electricity exceeds the available supply. It is a deliberate and temporary power outage initiated by the utility company to prevent the grid from collapsing due to an overload. Load shedding is often necessary during peak hours, when the demand for electricity is high, or during unexpected events, such as extreme weather conditions or equipment failures. The purpose of load shedding is to maintain the stability of the power system and prevent widespread blackouts. It is a crucial tool for managing the balance between electricity supply and demand and ensuring the reliability of the power grid. However, load shedding can cause inconvenience and economic losses to households and businesses, and it is important to implement load shedding in a fair and equitable manner [3,4].

Load shedding is typically implemented in a prioritized manner, with certain areas or customers receiving power priority over others. Critical facilities such as hospitals and emergency services are typically exempt from load shedding, while residential areas and commercial establishments may be subject to rotating outages as shown in Fig. 1. Load shedding can also have significant economic impacts, as it can disrupt production and lead to losses in revenue. As such, utilities and power grid operators must carefully balance the need for load shedding with the potential economic and social consequences. In recent years, there has been a growing interest in alternative solutions to load shedding, such as energy storage systems and demand response programs, which aim to reduce the need for load shedding by better managing electricity supply and demand. However, load shedding remains a critical tool for maintaining the stability and reliability of power systems.

A. Load shedding impact

Load shedding can have a significant impact on households, businesses, and the broader economy. Some of the impacts of load shedding include [5]:

- **Economic losses:** Load shedding can lead to significant economic losses, particularly for businesses that rely on consistent power supply to operate effectively. For example, manufacturing plants, data centers, and hospitals may be forced to shut down or operate at reduced capacity, resulting in lost productivity, revenue, and even job losses.
- **Disruption of daily life:** Load shedding can disrupt the daily lives of individuals and families, particularly those who rely on electricity for basic necessities such as heating, cooking, and lighting. It can also impact access to education, healthcare, and other essential services that require electricity.
- **Health and safety risks:** Load shedding can pose health and safety risks, particularly during extreme weather conditions. For example, households may be left without heating or air conditioning during periods of extreme heat or cold, leading to heat stroke or hypothermia. In addition, power outages can impact emergency services such as fire and police departments, leading to longer response times. Fig-1 shows power cuts across different parts of India.

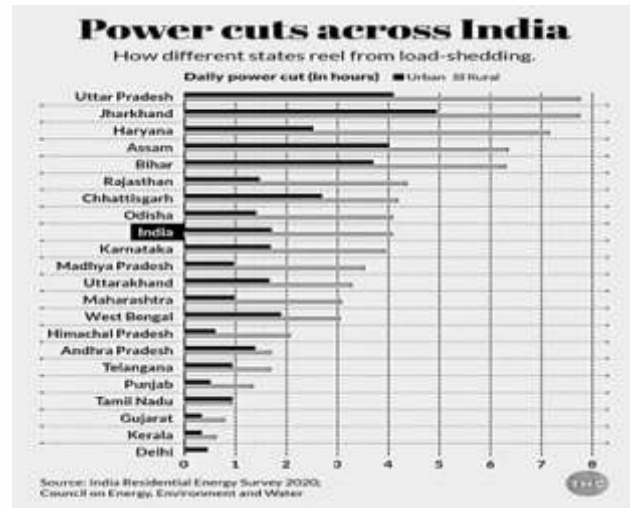


Fig. 1: Power cuts across different parts of India.

- **Damage to equipment:** Load shedding can also lead to damage to electrical equipment, particularly if the power supply is unstable or experiences frequent surges and spikes. This can result in costly repairs or replacements for both households and businesses.
- **Social and economic inequality:** Load shedding can exacerbate existing social and economic inequalities, particularly for vulnerable populations such as low-income households and those living in remote areas. These households may have limited access to alternative sources of power, such as generators or solar panels, and may be more severely impacted by power outages.

Overall, load shedding can have a significant impact on both individuals and society. It is therefore important to manage electricity supply and demand in a way that balances the needs of all stakeholders, while also ensuring a reliable and sustainable power supply for the future.

B. Load shedding Methods

There are several methods of load shedding that can be employed to manage electricity supply and demand. Some of the most common methods include [6]:

- **Rolling blackouts:** This method involves dividing an area into several zones and rotating power outages among them. Each zone experiences a predetermined period of power outage, typically lasting a few hours, before power is restored, and the outage shifts to the next zone. This method is



often used during periods of high demand or supply shortages.

- Demand response: This method involves incentivizing customers to reduce their electricity usage during periods of high demand. Customers can be offered rebates or other incentives for reducing their usage during peak hours, such as by turning off non-essential appliances or reducing their air conditioning use. This can help to reduce overall demand and avoid the need for load shedding.
- Energy storage: This method involves storing excess energy during periods of low demand and using it to supplement supply during periods of high demand. Energy storage systems, such as batteries or pumped hydro storage, can be used to store excess energy and release it when needed. This can help to balance supply and demand and reduce the need for load shedding.
- Interruptible load: This method involves providing customers with the option to have their power supply interrupted during periods of high demand in exchange for reduced rates. This is often used for large industrial customers who can temporarily shut down non-essential equipment or processes during peak hours.
- Emergency load shedding: This method involves quickly reducing power supply to certain areas or customers during emergency situations, such as during a power grid failure or natural disaster. This is done to prevent cascading failures that could lead to wider power outages [7].
- Distribution network reconfiguration: This method involves temporarily reconfiguring the distribution network to balance supply and demand [8]. This can involve rerouting power flows or temporarily isolating certain areas from the grid. Distribution network reconfiguration can be an effective method for managing localized supply and demand imbalances.
- Capacity markets: This method involves paying power providers to ensure that they have adequate capacity to meet demand. This provides a financial incentive for power providers to maintain sufficient capacity and avoid the need for load shedding.

Load shedding methods can be implemented in various ways depending on the circumstances and

goals of the utility. The most appropriate method will depend on factors such as the size and complexity of the power grid, the level of demand, and the availability of alternative power sources [9]. Effective load shedding strategies can help to ensure that electricity supply remains reliable and stable, even during periods of high demand or supply shortages.

III. Smart Inverters

Smart inverters are a type of power electronics device that converts direct current (DC) electricity generated by solar panels or other renewable energy sources into alternating current (AC) electricity that can be used to power homes and businesses. Unlike traditional inverters, which simply convert DC power to AC power, smart inverters are designed to communicate with other devices in the electricity grid and respond to changes in supply and demand in real-time.

Smart inverters can be used to help balance supply and demand in the electricity grid by adjusting their output based on changes in demand or the availability of renewable energy sources. For example, during times of low demand or high renewable energy production, a smart inverter might ramp up its output to take advantage of the excess energy. Conversely, during times of high demand or low renewable energy production, a smart inverter might reduce its output to help balance the grid [10].

Smart inverters can also be used to provide grid services, such as voltage support and frequency regulation. By providing these services, smart inverters can help to maintain grid stability and reliability, particularly as more renewable energy sources are integrated into the electricity grid.

In addition, smart inverters can be used in conjunction with energy storage systems, such as batteries, to create a more reliable and resilient energy system. By storing excess energy generated by renewable sources during times of low demand and discharging that energy during times of high demand, energy storage systems can help to balance supply and demand and reduce the need for load shedding.

Smart inverter hardware design

Smart inverter hardware design refers to the physical components and systems that make up a smart inverter, including the power electronics, control circuits, sensors, and communication interfaces. The

following are some of the key components of a smart inverter hardware design:

- **Power electronics:** The power electronics components of a smart inverter include the DC-AC inverter circuit, which converts the DC power from the solar panels or battery bank into AC power that can be used in the household or exported to the grid. The inverter circuit includes power semiconductor devices such as Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET) or Insulated Gate Bipolar Transistor (IGBT), as well as capacitors, inductors, and transformers.
- **Control circuits:** The control circuits of a smart inverter are responsible for monitoring and controlling the power output of the inverter. This includes regulating the voltage and frequency of the AC output, managing the charging and discharging of the battery bank, and coordinating with other inverters in a microgrid. The control circuits include microcontrollers, digital signal processors (DSPs), and other programmable logic devices.
- **Sensors:** Smart inverters rely on various sensors to measure key electrical and environmental parameters. This includes current and voltage sensors to measure the power output of the inverter, temperature sensors to monitor the temperature of the power electronics and battery, and irradiance sensors to measure the solar radiation level.
- **Communication interfaces:** Smart inverters are designed to communicate with other devices and systems in the electricity grid, including the utility grid, other smart inverters, and energy management systems. Communication interfaces may include Ethernet, Wi-Fi, Zigbee, or other wireless or wired protocols.

Overall, smart inverter hardware design is critical for ensuring the reliable and efficient operation of the inverter in a variety of applications, including grid-tied solar Photovoltaic (PV) systems, off-grid systems, and microgrids. By integrating high-performance power electronics, intelligent control circuits, accurate sensors, and robust communication interfaces, smart inverters can provide a range of benefits, including improved efficiency, reliability, and grid stability.

IV. Methodology

Hardware design Overview

The purpose of this circuit is to convert a 230V, 50Hz AC signal into a regulated 5V DC signal that can power small electronic devices. The circuit begins with a transformer that steps down the input voltage from 230V to 0-12V AC, 1 Amp. The secondary winding of the transformer is then connected to a bridge rectification diode, which converts the AC signal to a pulsating DC signal. The pulsating DC signal is then filtered by a large capacitor (1000 μ F/35V) that smooths out the voltage spikes and ripples in the signal. The output of the filter capacitor is then connected to an Integrated Circuit (IC) regulator (7805), which regulates the voltage to a constant 5V DC output. The regulator ensures that the output voltage is stable and free from any voltage fluctuations that may occur in the input signal. Finally, the output of the IC regulator is connected to an Light Emitting Diode (LED) through a current-limiting resistor. The LED provides a visual indication that the circuit is working, and the resistor limits the current flowing through the LED to prevent it from burning out.

To summarize, the circuit consists of a transformer, bridge rectification diodes, a capacitor, an IC regulator (7805), resistors, and an LED. When an AC signal is given to the primary coil of the transformer, the magnetic flux induces a current in the secondary coil due to the transformer action. The bridge rectifier diodes then rectify the output, but some AC ripple remains. A capacitor is added to remove the AC signal, and the IC regulator provides a fixed voltage output. The LED is used for indication purposes, and due to the forward bias, it glows when the circuit is working. The output of the circuit is obtained from pin no-3 of the IC regulator. Overall, this circuit is designed to

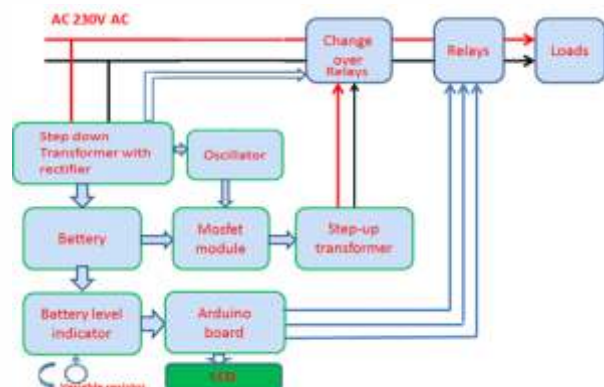


Fig 2: Block Diagram of the hardware design



provide a stable DC voltage output from an AC input signal. The overall hardware design can be understood with respect to a block diagram of the hardware setup as shown in Fig. 2.

V. Results

Here are some results from this study:

1. The design is able to provide a stable DC output voltage of 5V, which can be used to power various electronic circuits and devices.
2. The bridge rectifier and capacitor combination effectively convert the AC input voltage to a smooth DC output voltage, which is necessary for most electronic circuits to function properly.
3. The IC regulator (7805) provides a constant output voltage regardless of changes in load current, which ensures that the output voltage remains stable even when the load on the circuit changes.
4. The LED indicator provides a visual indication of the circuit's operation, making it easy to determine whether the circuit is functioning correctly.
5. The transformer plays a crucial role in stepping down the AC input voltage to a lower voltage level that can be rectified and regulated to provide a stable DC output voltage.
6. The use of diodes in a bridge rectifier configuration enables full-wave rectification, which results in a higher average DC output voltage compared to half-wave rectification.
7. The use of a capacitor in conjunction with the bridge rectifier ensures that the output voltage is smoothed and free of AC ripple, which is essential for many electronic circuits to function properly.
8. This work demonstrates the use of basic electronic components such as diodes, capacitors, voltage regulators, and transformers in a simple but effective circuit design.

VI. Conclusions

The Load Shedding by Smart Inverter aims to provide a solution to the power outage problem by using a smart inverter that can automatically detect the mains power failure and switch to battery power. This work also incorporates a load shedding mechanism to prioritize critical loads during a power outage.

Overall, this work is successful in achieving its

objectives. The smart inverter is able to efficiently switch between mains and battery power, and the load shedding mechanism ensures that critical loads are given priority during a power outage. The use of an LCD display and LEDs provide the user with a visual representation of the system status and battery level.

The work can be further improved by incorporating more advanced algorithms for load shedding, as well as adding additional features such as remote monitoring and control. Additionally, the use of renewable energy sources such as solar panels can further enhance the efficiency and sustainability of the system.

Overall, the Load Shedding by Smart Inverter serves as a viable solution to the power outage problem and demonstrates the potential for integrating smart technology into traditional power systems.

In conclusion, the load shedding by a smart inverter is a useful and innovative solution for managing power supply during an outage. This work makes use of a microcontroller, LCD, sensor, buttons, and LEDs to provide information about the status of the power supply and battery level.

The study has shown that it is possible to create a cost-effective and efficient load shedding scheme using readily available components. The use of a smart inverter allows for more control over the power supply, enabling the system to optimize power usage and extend battery life.

Overall, this study has the potential to be scaled up and implemented in homes and businesses to ensure uninterrupted power supply during load shedding periods. Further improvements could be made to this work, such as incorporating a more advanced battery management system and integrating with renewable energy sources.

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A Tiny chip could enable super-secure quantum Wi-Fi



A silicon chip, measuring 1.8 millimeters in width and 3 millimeters in length, contains more than 1000 components. This chip has the potential to enable wireless communication and eliminate the requirement for specialized conditioning in quantum devices. The chip includes 32 tiny antennas that can pick up and emit the quantum signals that move through free space. We may be a step closer to unhackable quantum Wi-Fi thanks to a chip that could establish wireless communication between a wide range of quantum devices. Quantum

communication systems have a distinct advantage over the wireless and fiber-based networks that we use now, they are incredibly hard to hack. This is because they use the quantum states of objects like particles of light to encode and transmit information – those states allow for more complex encryption and can easily reveal if they have been tampered with.

Source: <https://www.newscientist.com/article/2437975-tiny-chip-could-enable-super-secure-quantum-wi-fi/>

Unravelling the Intricacies of Gene Length, DNA Damage, and Aging-Related Disorders

Introduction

The process of aging is a complex interplay of biological mechanisms that impact cellular function, tissue integrity, and overall organismal health. In recent years, research efforts have increasingly focused on understanding the molecular underpinnings of aging, with particular attention paid to the role of gene expression regulation and Deoxy Ribonucleic Acid (DNA) damage. One emerging phenomenon in this field is gene-length-dependent transcription decline (GLTD), which has garnered significant interest due to its potential implications for aging-related processes and diseases. This comprehensive review aims to explore the intricate relationships between gene length, DNA damage, and aging-related disorders, providing insights into the underlying mechanisms and potential therapeutic implications.

Gene-Length-Dependent Transcription Decline (GLTD) in Aging

GLTD, characterized by a negative correlation between gene length and expression levels, has emerged as a notable phenomenon in aging research. Across various organisms, including humans, GLTD has been observed in diverse tissues and cell types, suggesting its widespread relevance in the aging process. While the precise mechanisms driving GLTD are still under investigation, emerging evidence suggests a link between GLTD and DNA damage, particularly in the context of chromosomal fragility and transcriptional machinery dysfunction. Understanding the nuances of GLTD may offer novel insights into aging biology and potential targets for therapeutic intervention.

DNA Damage and Aging

DNA damage accumulation is a hallmark of aging, contributing to cellular dysfunction, tissue degeneration, and the onset of age-related diseases. Various forms of DNA damage, such as oxidative lesions, double-strand breaks, and telomere attrition,

can disrupt genomic integrity and impair cellular function. Importantly, DNA damage has been implicated in the pathogenesis of aging-related disorders, including cancer, neurodegenerative diseases, and cardiovascular conditions. The intricate relationship between DNA damage and aging underscores the importance of elucidating the underlying molecular mechanisms and identifying strategies to mitigate its detrimental effects on cellular homeostasis.

Long Genes and Chromosomal Fragility

Long genes, particularly those involved in synaptic functions and cellular signalling pathways, have been found to intersect with chromosomal fragile sites, regions of the genome prone to DNA breakage and instability. This association between long genes and chromosomal fragility has important implications for aging-related disorders, as it may render these genes more susceptible to DNA damage-induced dysfunction. Studies have identified specific long genes implicated in both cancer and neurodegenerative diseases, highlighting the potential role of chromosomal fragility in driving age-associated pathologies. Further research into the mechanisms underlying the vulnerability of long genes to DNA damage is warranted to elucidate their contribution to aging-related disorders as shown in Fig 1.

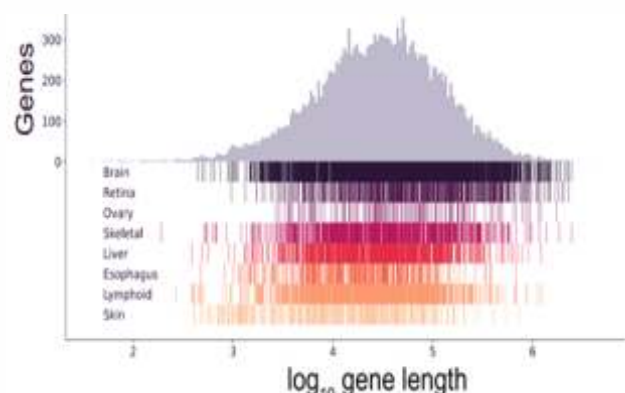


Fig - 1 The lengths of protein-coding genes in the human genome

Implications for Aging-Related Disorders

Understanding the interplay between gene length, DNA damage, and aging-related disorders has significant implications for disease prevention and intervention strategies. Targeting pathways involved in DNA repair, transcriptional regulation, and chromosomal stability may offer promising avenues for therapeutic intervention in age-associated pathologies. Additionally, the identification of biomarkers associated with GLTD and DNA damage could facilitate early detection and intervention in individuals at risk for age-related diseases. Overall, a deeper understanding of the molecular mechanisms underlying aging-related processes is essential for developing effective strategies to promote healthy aging and mitigate the burden of age-related disorders on global health.

Conclusion

In summary, the intricate relationships between gene length, DNA damage, and aging-related disorders underscore the complexity of aging biology. GLTD, driven by factors such as DNA damage and chromosomal fragility, represents a critical aspect of aging processes with broad implications for health and disease. Continued research efforts aimed at elucidating the molecular mechanisms underlying these phenomena are essential for advancing our understanding of aging biology and identifying novel therapeutic targets for age-related diseases. By unravelling the intricacies of gene length regulation, DNA damage response, and aging-related pathology, we may ultimately pave the way for interventions that promote healthy aging and improve the quality of life in aging populations.

Excerpted from 'Trends in Genetics'

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A New Device Measures Greenhouse Gas Captured In Building Material Quickly and Easily



Fig. 1

A combination of multiple steps consolidated into a single process: The newly developed equipment, known as The Concrete Thermal Gravimetry And Gas Analyzer (Right Part of Fig. 1), is capable of performing the same procedure in a significantly shorter duration, approximately one-third of the time required by existing technologies (Left Part of Fig.1). An innovative technology has been developed that can efficiently quantify the amount of carbon dioxide(CO₂) contained in concrete, offering a streamlined and expedited alternative to existing techniques, completing the measurement process in only one-third of the time. The concrete thermal gravimetry and gas analyzer is a boxlike

device developed by researchers at the University of Tokyo in collaboration with industry engineers. In contrast to the existing procedure, which entails a tedious and complicated process of crushing concrete samples into fine particles for analysis, this novel approach is easier, more precise, and user-friendly. The researchers anticipate that it will make a valuable contribution to CO₂ trading in the future, as the concrete and cement industry attempts to balance their emissions in alignment with global objectives for greenhouse gas management.

Source: <https://techxplore.com/news/2024-06-device-greenhouse-gas-captured-material.html>

Ratan Tata

“I don't believe in taking right decisions. I take decisions and then make them right.” – Ratan Tata

The world of entrepreneurs has many flourishing personalities who have prominently risen and contributed in various fields. One such moniker that history will never forget for his selfless work is RATAN TATA. Born on 28th of December 1937 in Bombay Presidency, British India into a Parsi Zoroastrian family. All our dreams can come true if we have the courage to pursue them. Coming from a lineage filled with a business mind paved his career path in the field of entrepreneurship. Such background led him to get enrolled in the best schools and colleges across India and worldwide. He enrolled in Cornell University, where he graduated with a bachelor's degree in Architecture. Later he became the largest international donor in the university's history. In 1961 he joined the firm and toiled at the shop floor of Tata Steel. Later he ended up in a managerial position in the firm. His working with the National Radio and Electronics eventually collapsed during an economic slowdown. In 1991 he was declared as the successor, after stepping down of J.R.D Tata as the then chairman of Tata & Sons. Operational freedom provided under the former chairman was stiffened by Tata. Being philanthropic led him to design policies to consolidate power, contributing their profit to build the Tata Group band. Tata hierarchized innovation and working with responsible young minds. Under his authority he streamlined company operations and exiting unrelated business to adopt globalisation. He made remarkable profit under his 21 years tenure, revenue grew over 40 times and profit over 50 times. He made Tata Tea acquire Tetley, Tata Motors acquire Jaguar & Land Rover & Tata Steel acquire Corus. These acquired assets relocated Tata from an Indian renowned brand into a global business with 65% revenues. His gestation for providing affordable cars for Indian household was a huge success with the development of Tata Nano Cars. Functioning perfectly for 75, Ratan Tata resigned from his position in the Tata Group on 28th December 2012. Even after company refusal, Cyrus Mistry was assigned as the successor but got removed as the chairman resulting in Ratan Tata being the interim chairman. Tata also has invested in



multiple companies like Snapdeal, Teabox, CashKaro.com. In April 2015 Tata acquired stake in Xiaomi and in 2016 he invested in Nestaway an online realty. Tata is an adherent of education, medicine rural development and is known as a leading philanthropist in India. Tata Consultancy Services (TCS) the most popular company has made the largest ever donation to Carnegie Mellon University for research purpose regarding cognitive systems and autonomous vehicles. In 2014 Tata Group endowed and created Tata Centre for Technology and Design for developing design and engineering principles for the needs of common. They gave 950 million donation for this purpose. Under the chairmanship of Ratan Tata the group provided a grant of 750 million to Centre of Neuroscience, Indian Institute of Science and formed the MIT Tata Center of Technology and Design at MIT respectively. Being a great humanitarian helped him deserve the highest civilian honours awarded by the government on India, Padma Bhushan in the year (2000) and Padma Vibushan (2008). He received both national honours and state civilian honours like Maharashtra Bhushan (2006) and Assam Baibhav (2021). Tata got featured in the Mega Icons (2018-2020) an Indian documentary series about prominent Indian personalities and their notable contributions on National Geographic.

Source: en.wikipedia.org

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Highway Over Speed Detection System

Abstract – Overspeed is the major cause of road accidents. In this busy life schedule, people always prefer to drive at very high speed rather than low speed to reach their places in time. The objective of this work is to detect the over speed of vehicles on the highway road. Although a maximum speed limit on the highway, many accidents keep on because of speed driving. It is necessary to solve these problems through electronic circuits. This work describes speed detection system for vehicles. The highway traffic police find it easy to check speed by using this system. This system mainly consists of Arduino UNO, two IR sensors, GPS, GSM, a 16x2 LCD display, and a buzzer. The detected speed is displayed on LCD. Moreover, if the vehicle crosses the limited speed (greater than 50kmph), this system displays the condition of over speed on LCD, and the buzzer is alarmed. The overspeed alert message along with the location is sent through GSM and GPS.

Keywords – Arduino UNO, IR Sensors, Buzzer, 16x2 LCD, GPS, GSM, speed detection.

I. Introduction

The major concern of vehicle accidents is the part of continual disaster lists, which might happen anywhere anytime. In accordance with Association for Safe International Road Travel Report, around 1.24 million people die and 50 million people get wounded on the roads each year in the World. Statistically, they are assumed as the second most important reasons for death. In order to overcome these problems, many automobile device industries and vehicle manufacturers have tried to propose speed control techniques in order to keep up a vehicle safe distance. In this direction, the effort is going on devising a security driving application for vehicles by new rising IoT-oriented technology, which is employed for devising a more effective solution [1]. The IoT (Internet of Things) is the interrelation of distinctly identifiable embedded computing appliances inside the existing infrastructure. IoT provides sophisticated connectivity of systems, services and devices, which goes beyond M2M (Machine to Machine Interactions) and covers different domains and applications. This interrelation of embedded appliances like smart objects is implemented in all automation enabling modern applications such as Smart Grid [2]. In many parts of the highway road, accidents found a major social problem. There are several reasons to why vehicle accidents. Most of accidents on the highway road cause by high-speed driving. Some highway road has signboards signifying maximum speed limit permitted while driving such as 60 km/h for the driver's safety, but some people do not follow the speed limit. Therefore, the vehicles keep a constant speed within the speed limit over a particular area. In

this project, a speed detection system for vehicles is proposed. This system provides very effective in the detection of over speed driving. This circuit is mainly consisting of Arduino UNO, two IR sensors, GPS, GSM, 16x2 LCD and a buzzer. When a vehicle is passing between the first and second sensors, the two sensors sense the object and then the microcontroller program will start counting. When it passes the second sensors, the microcontroller will stop counting and calculate the speed as kilometer per hour. If the vehicle's speed is over speed (greater than 50 km/h), the buzzer will be alarmed and LCD displays the speed of vehicles. This paper intends to design a system of detection on highway road for vehicles. This system is to improve a device that detects over speeding of vehicle, gives warning using alarm and display vehicle's speed in LCD. The location (latitude and longitude) is tracked by the GPS and the Overspeed message is sent to the mobile phone through GSM.

II. Literature Review

The authors have presented EBM (Eye Blink Monitoring) technique, which alerts the focus during drowsiness state. An embedded system depends on the psychological state of focus through monitoring head movements and eye movements are helpful in alerting drivers at the sleep cycle stage of drowsiness. An ordinary eye blink moment has no effect on the system results [1].

In [2], researchers have designed Automated Speed Detection System that may detect the vehicle's speed and if over speeding happens, then remove the particular vehicle's license number and send it through mail to Toll Plaza in order to indict fine. Here, Doppler

Effect observable fact is employed for measuring the speed. If over speeding is identified, then a camera captures the image of a vehicle automatically; and DIP (Digital Image Processing) methods are used to remove the license number. The findings have revealed that the developed system detects over speeding vehicle successfully, mines the license number, has great performance and may be used on roads to test out for over speeding vehicles.

The researchers, in [3], have designed and developed a novel system, which may efficiently identify speed violations on roads and helps driver to respect traffic rules by maintaining speed along with the prescribed speed limit. The developed system contains RFID (Radio Frequency Identification), GSM (Global System for Mobile) and Programmable Intelligent Computer (PIC). This system has provided reliable, low cost, effective results and real-time notification.

In [4], the authors have proposed a new Vibration Sensor Device that was set on the vehicle. If any accident happens, vibration is activated and then vehicle's location has been detected with the help of GPS locator. Immediately, the incident has been intimated to Patrol and Life support in order to recuperate the accident as well as suspect is to be tracked by means of GPS locator. The researchers have estimated the speed of vehicles by incorporating the accelerometer readings throughout the time and determine the acceleration faults. Widespread experiments were carried out so that sensor speed is precise and strong on real driving atmospheres.

The authors [5] have presented a system to identify rash driving on the highways as well as to alert the traffic authorities if there is any violation. Many approaches need human focus and engage many attempts that is complex to execute. In this article, the researchers have aimed to propose a device for the early detection and provided alert of risky vehicle during patterns linked to rash driving. The whole implementation needs IR transmitter and receiver, a buzzer and a control circuit. If the vehicle exceeds the speed limits, then a buzzer signal sounds warning the police.

III. Design and Implementation of System

This system is design to detect an over speeding vehicle by computing the speed of the passing vehicle using the time taken to travel between two sensors at a

fixed distance. In this system, IR Sensors are the main part of circuit design that detects the speed of the vehicles. The system keeps the time taken by the speed of the vehicle in crossing the fixed distance from two sensors. When the vehicle passes through the first IR sensor, this sensor gets activated. From this instant forward, a timer is initiated and will continue to keep time until the vehicle reaches the second IR Sensor. Then the microcontroller starts to count the time and calculate the speed of the vehicle as km/h and this speed is displayed on a 16X2 LCD Module. If the vehicle's speed is greater than the limited speed, the buzzer will be alarmed and then LCD will be displayed as "Over speeding" and the alert message is sent through GPS and GSM. Fig. 1 shows block diagram of this system.

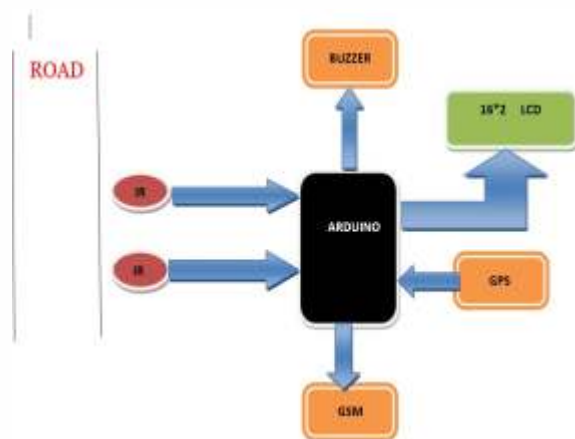


Fig. - 1 Block Diagram of the proposed system

A. Components required

Infrared (IR) Sensors

IR sensor is an electronic device, that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, but infrared sensor can detect these radiations.

Arduino UNO

Arduino UNO is a microcontroller board based on the ATmega328P. The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms.

16x2 LCD

An electronic device that is used to display data and the message is known as LCD 16x2. As the name suggests, it includes 16 Columns & 2 Rows so it can display 32 characters (16x2=32) in total & every character will be made with 5x8 (40) Pixel Dots. So, the total pixels within this LCD can be calculated as 32 x 40 otherwise 1280 pixels.

GPS

A GPS (Global Positioning System) module is an electronic device that receives signals from a network of satellites orbiting the Earth and uses those signals to determine the module's location on the planet. The GPS module contains a GPS receiver chip that communicates with the satellites and receives location and time data. The module may also contain additional components such as an antenna, a microcontroller, and memory to store location data. GPS is used to detect the Latitude and Longitude of any location on the Earth, with exact UTC time (Universal Time Coordinated). GPS module is the main component in our project. This device receives the coordinates from the satellite for each and every second, with time and date. GPS module sends the data related to tracking position in real time. GPS modules are commonly used in navigation systems, smartphones, and other electronic devices that require accurate location information. They are used to track the location of vehicles and assets, to navigate on land, sea, and air, and to create maps and geospatial data. GPS modules are also used in scientific research, for example, to track the movement of animals or to study weather patterns.

GSM

A GSM (Global System for Mobile communication) module is an electronic device that allows IoT (Internet of Things) devices to communicate over cellular networks using the GSM standard. The GSM module contains a SIM (Subscriber Identity Module) card slot, a GSM modem, and an antenna. It enables remote monitoring and control of IoT devices over cellular networks, which can be particularly useful in areas where Wi Fi or other wireless technologies are not available or reliable.

BUZZER

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal

from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

B.Circuit connection

Fig. 2 shows the circuit connection of the proposed system. IR sensor 1 is connected to A0 of Arduino. IR sensor 2 is connected to A1 of Arduino. Buzzer is connected to Pin13 of Arduino. RS of LCD is connected to Pin 2, RW is connected to ground, EN is connected to Pin 3, Data Pins of LCD (D4, D5, D6, D7) is connected to Pin 4, Pin 5, Pin 6, Pin 7 of Arduino respectively. RX of GSM is connected to digital Pin 0 and TX of GSM is connected to digital Pin 1 of Arduino. RX of GPS is connected to -9 and TX of GPS is connected to 8 of Arduino. Pin 9 and 10 of Arduino is connected to Crystal.

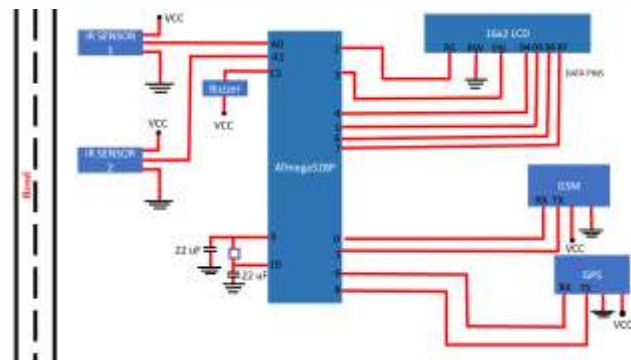


Fig. 2 Circuit Diagram of the proposed system

IV. Working of the System

This project consists of two digital IR Sensors, which consists of an IR Transmitter (IR LED), an IR Receiver (Photo Diode), a Comparator IC and a few supporting components. The IR Transmitter and Receiver Pair are placed side-by-side so that they form a Reflective Type IR Sensor. In this type, the IR Transmitter continuously emits Infrared radiations and if there is no object in front of the sensor, none of the Infrared radiation gets reflected back to the IR Receiver. But if there is an object in front of the sensor, some of the infrared radiation hits the object and gets reflected back. This reflected radiation falls on the IR Receiver, which means that the sensor has detected the object. IR Sensors are the main part of the project that detect the

speed of a vehicle. Practically, the setup of IR Sensors can be implemented in many ways but in this project, two reflective type IR Sensors have been used and placed at 20cm apart. When a vehicle reaches the first sensor, the IR Sensor gets activated. From this moment onward, a timer is initiated and will continue to keep time until the vehicle reaches the second IR Sensor. The speed of the car can be calculated the car travels from IR Sensor 1 to IR Sensor 2 with the help of distance-time relationship. Arduino continuously reads the inputs from the IR Sensors. When a vehicle moving in front of the setup reaches the first sensor, Arduino becomes alert and capture a time stamp the moment the vehicle leaves the first IR Sensor. Another time stamp is recorded when the vehicle reaches the second IR Sensor. Millis function of Arduino used for capturing the time stamps. Arduino then calculates the speed by assuming the distance as 5 meters between the two IR Sensor and displays the result in kilometers per hour on the 16×2 LCD Display. All the calculations and data gathering are done by Arduino and the final result is displayed on a 16X2 LCD Module. Arduino is used for controlling the whole process with a GPS Receiver and GSM module. GPS Receiver is used for detecting coordinates of the vehicle, GSM module is used for sending the coordinates to user by SMS. If the vehicle exceeds the speed limit, over speed message is displayed in the LCD and the location as well as speed of the vehicle is sent to the mobile phone by SMS through GPS and GSM.

V. Flowchart of the System

The overall flowchart of the system is shown in Fig. 3. There are two IR sensors. When the vehicle crosses the first IR sensor the timer 1 starts and when the vehicle crosses the second sensor timer 1 stops. Then the time taken by the vehicle is calculated by taking the difference between the timer start and timer end. Arduino measures the speed of vehicle which is measured by distance and time relationship $s=d/t$ (where s = speed of the moving object, d = distance between the two sensors and t = the time measured by Arduino). If speed of the vehicle is greater than 50kmph, buzzer will ring and overspeed message is displayed in the LCD and message is sent to the registered mobile number.

VI. Results and Analysis

In this section, the testing results of speed detection

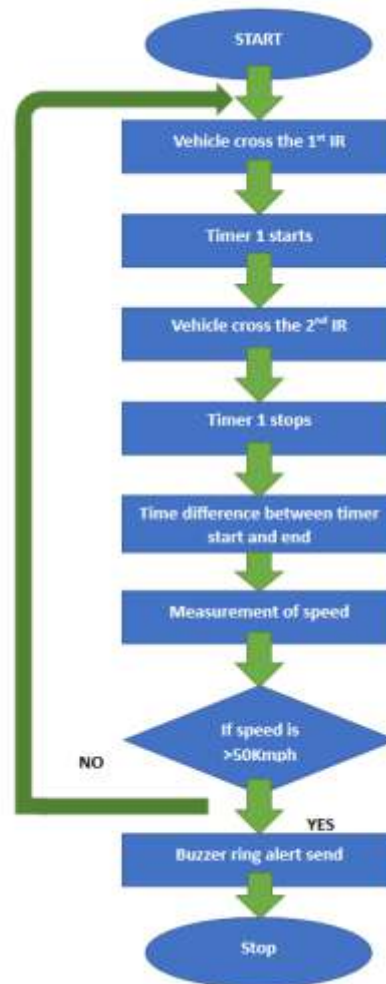


Fig. 3 Flowchart of the system

system are shown. Fig. 4 shows hardware implementation of overall speed detection system for vehicles. It consists of Arduino Uno, two IR sensors, LCD display, GPS, GSM and buzzer. Arduino Uno is used to acquire the input data from sensors and buzzer is used for alarm system and then show warning message on LCD. In this system limited speed is 50 km/h. The experimental output results can be proved

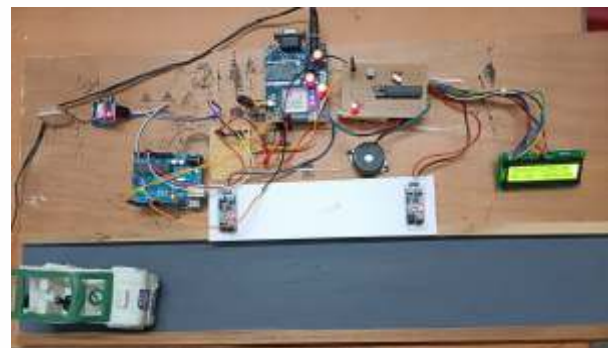


Fig. 4 Hardware implementation of the system

in this section.

Case1. When no vehicle is detected, “No car detected” message will be displayed in the LCD (as shown in Fig. 4.1).



Fig. 4.1 Case 1

Case 2: When the vehicle is moving with normal speed “Normal Speed” message will be displayed in the LCD (as shown in Fig. 4.2).



Fig. 4.2 Case 2

Case3. When the vehicle is moving with over speed buzzer wil ring and “over Speeding” message will be displayed in the LCD and alert message is sent through SMS (as shown in Fig. 4.3 and Fig. 4.4).



Fig. 4.3 Case 3

VII. Conclusion

In this paper, the speed of the vehicle can be easily detected by utilizing Arduino and IR sensors so that it alerts the over speed of vehicles. The location can be easily tracked and the message can be sent through



Fig. 4.4 Alert message through SMS

GPS and GSM. The system accumulates information of vehicle Speed (moving objects) by displaying on LCD display and if over speed occurs it alerts by giving buzzer. The designed detection system continuously monitors the speed of the approaching vehicle. It minimizes the difficulties of traffic department and make ease to control the rash driving / over speed vehicles on highways. So that, the police can provide their service with more ease and accuracy while sitting in control room. In future, this system can be extended by integrating a camera which could capture the image of the number plate of the vehicle and sends to the traffic authorities or the corresponding vehicle owner.

VIII. Acknowledgment

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AI Speech Generator 'Reaches Human Parity'



AI speech generator 'reaches human parity' — but it's too dangerous to release, scientists say Microsoft's VALL-E 2 can convincingly recreate human voices using just a few seconds of audio, its creators claim. VALL-E 2 is a text-to-speech (TTS) generator that can reproduce the voice of a human speaker using just a few seconds of audio. Microsoft researchers said VALL-E 2 was capable of generating "accurate, natural speech in the exact voice of the original speaker, comparable to human performance," in a paper that appeared June 17 on the pre-print server arXiv. In other words, the new AI voice generator is convincing enough to be mistaken for a real person — at least, according to its creators. VALL-E 2 is the latest advancement in neural codec language models that marks a

milestone in zero-shot text-to-speech synthesis (TTS), achieving human parity for the first time," the researchers wrote in the paper. "Moreover, VALL-E 2 consistently synthesizes high-quality speech, even for sentences that are traditionally challenging due to their complexity or repetitive phrases." Human parity in this context means that speech generated by VALL-E 2 matched or exceeded the quality of human speech in benchmarks used by Microsoft. The AI engine is capable of this given the inclusion of two key features: "Repetition Aware Sampling" and "Grouped Code Modelling."

Source:

<https://www.livescience.com/technology/artificial-intelligence/ai-speech-generator-reaches-human-parity-but-its-too-dangerous-to-release-scientists-say>

Placement of Electric Vehicle Charging Stations in Distribution System Considering Road Network and Uncertainties

Shortage of fossil fuels and serious pollution issues all over the world, seeking necessary research on alternative ways. Transportation is one of the main sectors of fossil fuel consumption and it contributes massively to air pollution. Electric vehicles (EVs) are a key solution to those problems in the transportation sector. The traditional fossil fuel-based vehicle can be replaced by the EV. The electricity for charging the EV can be efficiently received from renewable-based generations like hydro, solar, wind energy, etc. instead of conventional fossil fuel-based generation. Fast deployment of EVs has been seen in recent years, which arises the need for available EV charging stations (EVCSs) at suitable places. However, it is very challenging for the planning engineers to find the optimal locations and capacities of the EVCS keeping the power distribution network (DN) healthy as well as smooth accessibility of EVCSs to EV users.

In this work, EVCSs have been allocated by superimposing the power DN and road network together including the effect of both of them. Electrical energy loss and voltage deviation of the power DN have been minimized to keep it healthy. On the other hand, the investment cost of the EVCSs has been minimized and users' accessibility of EVCSs has been maximized for rendering better services. Solar-based distributed generations (SDGs) have been allocated to make the power DN renewable supported, which also reduces the electrical energy loss and improves the voltage profile. To coordinate the non-dispatchable renewable generation with dynamic load demand, battery energy storage (BES) has also been introduced into the system and its optimal operation scheduling has been performed.

The EVs have been optimally assigned to the appropriate EVCS based on the factor of minimum

energy consumption during the travel to the EVCS. This has been achieved by selecting the optimal EVCS for every EV and their best route to the EVCS considering the possible shortest distance and traffic congestions. Assigning an EV at a particular EVCS is also subjected to the availability of charging port. This assignment problem has been solved using integer linear programming and the shortest route has been found using Dijkstra's algorithm.

A user convenience factor has been proposed to decide the locations of EVCS with respect to the road network to make it more accessible to the users. A user happiness factor has also been introduced to decide the number of charging ports and the number of EVCSs as per the users' requirements. To handle the rising power demand due to the EV charging along with conventional load, a multi-stage DN expansion planning has been performed optimally. Line up-gradation, substation up-gradation, addition of new EVCS, allocation of Distribution Static Compensator and allocation of DG have been performed during the expansion planning process with minimum investment and operation maintenance cost.

All the possible uncertainties associated with EV, SDG, conventional load and traffic flow have been taken care of mathematically during the solution process with the help of 2m point estimation method. Various well-established and recent optimization techniques have been used to solve the above-mentioned optimization problems. Solutions obtained using different techniques have also been validated. Moreover, statistical hypothesis tests like Wilcoxon signed rank test and Quade test have been used to check the robustness of the result obtained during the solution process.

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Green Building and its Significance

Green buildings are structures designed, constructed, and operated to minimize environmental impact and maximize resource efficiency. They incorporate sustainable practices in their design, construction, and operational processes, aiming to reduce energy and water usage, minimize waste, and improve indoor air quality.

Significance of Green Buildings:

1.Environmental Benefits: Green buildings significantly reduce the carbon footprint of construction and operation. By using less energy and water, they help conserve natural resources and reduce greenhouse gas emissions. The incorporation of green spaces and sustainable site planning can enhance local biodiversity and reduce urban heat islands.

2.Economic Benefits: Although the initial costs might be higher, green buildings offer long-term financial savings through reduced utility bills, lower maintenance costs, and higher property values. Additionally, they can attract government incentives and tax rebates for sustainable practices.

3.Health and Well-being: Green buildings provide healthier indoor environments with better air quality, natural lighting, and thermal comfort, which can improve the well-being and productivity of occupants.

Reduced exposure to toxic materials and better ventilation can lower the risk of respiratory and other health issues.

4.Social Benefits: These buildings can serve as a model for sustainable living, educating the public about the importance of environmental stewardship. They can also foster community development by creating healthier, more sustainable urban environments.

Of the several green buildings one that is most noteworthy is that of Suzlon One Earth. Suzlon Energy Limited pledged to make the greenest office in India. The building is 3-story high and is constructed on 10.5 acres. It achieved Leadership in Energy and Environmental Design (LEED) for New Construction Platinum certification from the India Green Building Council and Five-Star GRIHA (Green Rating for Integrated Habitat Assessment) certification. Inspired by vernacular architecture, the planning provides 90% of the spaces with daylight and external views, allowing inhabitants to enjoy seasons and weather and connect with the time of the day. 5% (154 kilowatts) of its annual energy is generated through conventional and building-integrated photovoltaic panels (20%) and wind turbines (80%), on-site.



Source: [10 Green Buildings In India That Inspire The World | The Design Gesture](#)

Sustainable Community

A sustainable community manages its human, natural, and financial capital to meet current needs while ensuring that adequate resources are available for future generations. It is believed that, strong and sustainable communities are the foundation of a peaceful and healthy planet for humanity. The sustainable community takes into account, and addresses, multiple human needs, not just one at the exclusion of all others. It is a place where people of diverse backgrounds and perspectives feel welcome and safe and every group has a seat at the decision-making table, and prosperity is shared.

The various key considerations for designing a sustainable community include site selection, energy efficiency, water management, waste reduction, green spaces, biodiversity preservation. Climate change, income inequality, and social injustice are the biggest threats to build strong, sustainable communities. The four major elements of Sustainable Community can be

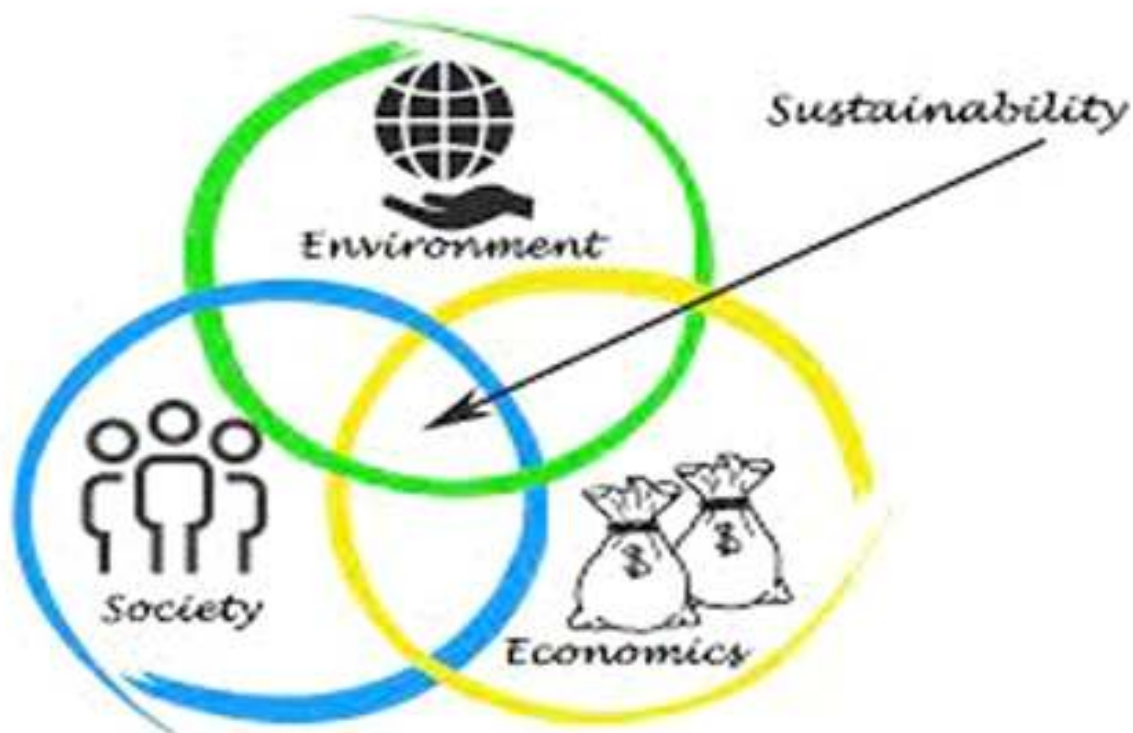
categorized as:

- 1) Leadership, Civic Engagement and Responsibility
- 2) Ecological Integrity
- 3) Economic Security
- 4) Social Well-Being

As the planet is beginning to unravel by adverse human impact resorting to living in sustainable communities is a step in the right direction.

Source:

<https://www.yourbackyard.org.uk/what-is-a-sustainable-community-and-what-does-it-mean-for-you/>



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Contents

Editorial	2
Technology Updates	8
DD Feature	10
Breakthroughs in Bio-Technology	16
Profile of an Entrepreneur	18
PhD Synopsis	25
Environmental Concerns & Awareness	27

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