International Journal of Advanced Engineering Science and Information Technology (IJAESIT)
ISSN: 2349-3216
Vol.6, No.6, June 2023

Smart Sensitive Windows and its Applications

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Abstract*— *This Sensitive windows and weather monitoring system collect real-time weather information such as temperature, relative humidity, heat index, wind speed or cloudy weather and showers on the Internet through a data acquisition system. Then the data processing system intelligently decides to open the horizontal pivot window to a certain width, and the control system and the actuator control the opening of the window to a predetermined width. This window can intelligently adjust the opening of the window and also produce electricity according to the change of the weather, so as to improve the indoor temperature and humidity, and improve the indoor air quality and light. This intelligent window system has great application values.

***Keywords* –** Internet of Things, Solar panels, Zigbee network, Smart window.

I. INTRODUCTION

In recent years, the technology advancement is increasing enormously things getting automated which makes our daily life easier. Here, In this paper Smart Sensitive windows and weather monitoring are innovative type of glazing technology that can alter their properties in response to external stimuli, such as light, heat signals and also by using this windows produce electricity which solar cells is coated on the windows. These windows offer a range of benefits over conventional static glazing, including energy savings, improved indoor comfort, enhanced privacy, and reduced glare. Smart windows have gained significant attention in recent years due to their potential for energy conservation and sustainability in homes, institutions, schools, hospitals etc., by dynamically adjusting their properties, smart windows can help regulate the amount of heat and light entering a building, reducing the need for artificial lighting and air conditioning.

This can lead to significant cost savings and environmental benefits, such as reduced greenhouse gas emissions. Moreover, smart windows have the potential to transform the way we interact with our built environment, offering a new level of customization and control over our surroundings. They can be integrated with building automation systems to create intelligent and responsive environments that adapt to the needs and preferences of their occupants. Significant growth is estimated for the IoT market given its impact in various areas, such as homes, institution, cities.

Unlike other smart windows proposals, this paper has solar technology which is automated to get energy from environment used for backup or other works and also this is ecofriendly. In this paper, we will provide an overview of the state of the art in smart window technology and solar usage which is needed for present and future requirement for the people.

II. RELATED WORK

In this SMART SENSITIVE WINDOWS, we have used LM o 35 sensor (temperature Sensor), MQ35 sensor (Gas detecting sensor), Rain sensor, Windows coated by solar cells which is connected battery and servo motor for windows adjustment to make compactible windows. MQ35 gas sensor is designed to detect hazardous gases, including ammonia, nitrogen oxides, benzene, and other volatile organic compounds (VOCs). It can provide a high level of sensitivity and selectivity for detecting hazardous gases. As adding this MQ35 because of recent leakage of radiation in Bangalore makes to add gas sensor in this windows. LM35 is a temperature sensor that provides a linear output voltage proportional to the temperature in Celsius. It has a simple design, low cost, and high accuracy, and can be used in our windows. In this project, only requires temperature measurement, and high accuracy is crucial, LM35 may be a suitable option due to its high accuracy and low cost. The LM35 sensor can measure temperatures in the range of -55°C to +150°C, making it suitable for use in both hot and cold environments. The sensor has several advantages, including its low power consumption, fast response time, and high accuracy. If we need humidity we can use DHT22 sensor which is almost similar to LM35 but this sensor accuracy level and data transfer rate is slow when compared to LM35. A raindrop sensor is used to detect raindrops and measure rainfall. The sensor typically consists of a small circuit board with a set of conductive probes that are exposed to the environment. When raindrops fall on the probes, they complete a circuit, which triggers a response from the sensor. Raindrop sensors are typically designed to provide accurate

measurements of rainfall that require precise data. LDR stands for Light Dependent Resistor .It is an electronic component that changes its resistance in response to changes in the ambient light intensity. The working principle of LDR is based on the internal photoelectric effect. When photons (light particles) hit the surface of the LDR, they excite electrons in the semiconductor material, which increases the flow of current through the material. The increase in current flow reduces the resistance of the LDR, allowing more current to flow through it. Solar cells coated windows, also known as solar windows or photovoltaic (PV) windows that allows windows to generate electricity by converting solar energy into electrical energy. These windows are made of transparent conductive coatings and have a layer of PV material deposited onto the surface. The PV material absorbs solar energy and converts it into electricity, which can be used to power the building or be fed back into the grid. ESP32: The ESP32 is a low-cost, low-power system-on-a-chip that is commonly used for IoT projects. It has built-in Wi-Fi and Bluetooth connectivity, making it easy to connect sensors and transfer data wirelessly.

III. THE PROPOSED MECHANISM

When the rain comes the rain sensor collects the data send to the ESP32 which makes the windows to closes itself automatically to make internal environment protected and the temperature is also monitored by LM35 according to internal environment .Other than it the rain and temperature sensor together work during day time to make internal environment comfortable . Initially, the data is updated and the windows work according to it. During day time the windows turns according to angles which is proportional to light intensity in other side the solar cells collects the heat which is converted into electrical energy later. The energy is saved in the battery which is used for further usage.

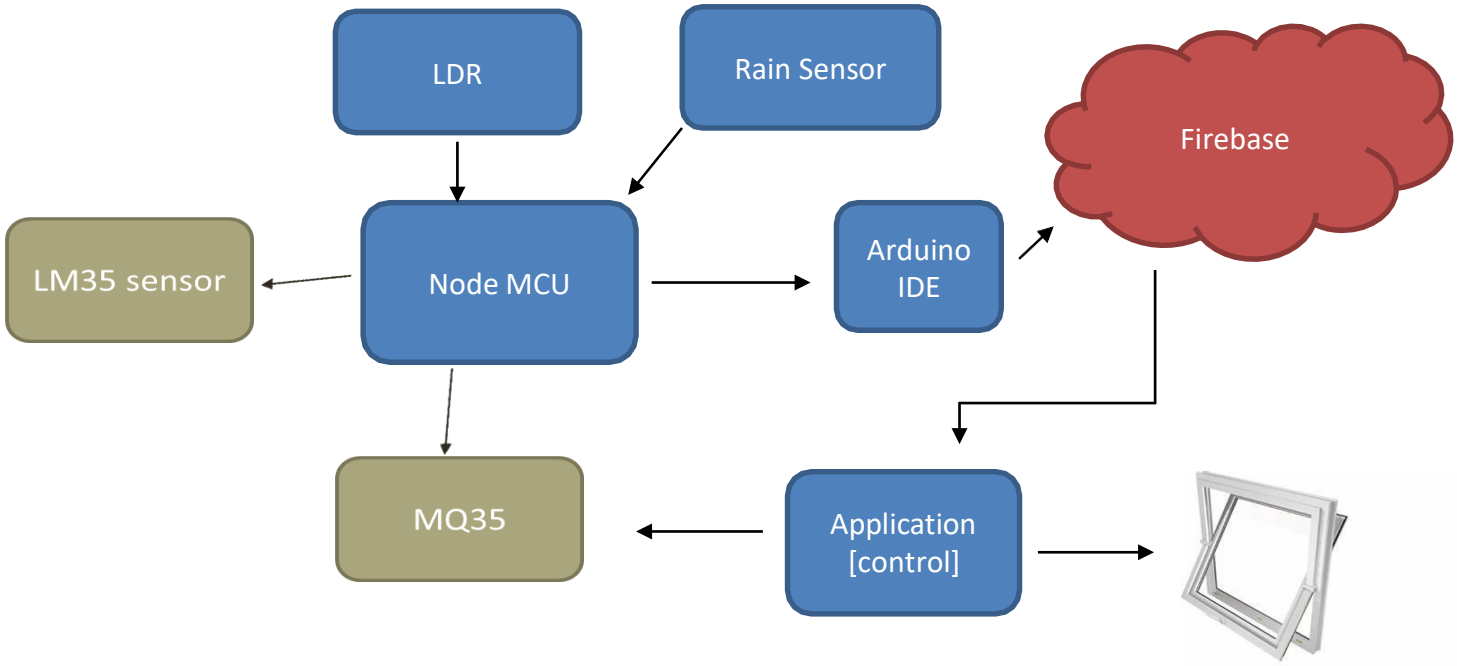

Figure 1. Model

All these are connected to the firebase server in which the data is collected send it to the application whether mobile or web.
By using this application, we can able to monitor the temperature, heat level, and rain fall and light intensity. In this we can able to access the position of windows which is automated according to updated data. If any leakage of hazardous gases which is detected by MQ35, the windows changes its position according to environmental parameters [internal and external environment] respectively.

IV. Future works

The UI/UX of the application can be updated and to add more feature which makes the human life more comfortable .To make the internal sustainable and self-dependent to electricity**.**

V. Conclusion

In conclusion, smart windows offer numerous benefits and have the potential to revolutionize the way we interact with our living and working spaces. These technologically advanced windows are capable of adapting to changing environmental conditions, enhancing energy efficiency, improving occupant comfort, and providing innovative features for convenience and safety. Smart windows also contribute to enhanced occupant comfort by maintaining optimal indoor temperatures. By selectively blocking or allowing solar radiation, they can help to prevent overheating during hot summers and retain warmth during colder seasons. This not only creates a more pleasant environment but also reduces reliance on heating, ventilation, and air conditioning (HVAC) systems, thus promoting energy conservation and sustainability.

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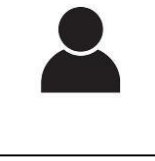

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