

PERSISTANCE OF VISION

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Abstract: The objective is to create a visually striking display that utilizes the phenomenon of persistence of vision to generate the illusion of floating images or messages in mid-air with easy implementation technique. This project aims to create a captivating visual display that utilizes the phenomenon of persistence of vision to create the illusion of static or moving images. By rapidly flashing or changing the displayed content in synchronization with the viewer's perception, the POV display creates a continuous image that appears to defy reality.

The project leverages an ESP32 microcontroller, which serves as the central control unit for the display. Individual LEDs are used as the light source, arranged in a linear configuration, which is mounted on the blades of the fan. The LEDs are selectively activated in a precise sequence, taking advantage of the persistence of vision phenomenon, to create the perception of a static or moving image. The software implementation includes programming the ESP32 to control the LED activation patterns, timing, and synchronization with the fan's rotation. The display content, such as text, patterns, is designed to be mapped to the LED activation sequence, considering the speed of the rotating fan blades. The objective is to create a visually striking display that utilizes the phenomenon of persistence of vision to generate the illusion of floating images or messages in mid-air with easy implementation technique. This will enable small-scale businesses to advertise their business or products at a very subsidized cost.

Keywords: ESP 32, LED's, 9v battery, 220ohms Resistor, Firebase, Mobile Application, Arduino IDE.

I. INTRODUCTION

Throughout generations, advertisements have evolved from one-way communication to interactive and immersive experiences. They have shifted from solely focusing on product features to emphasizing storytelling, emotions, and social impact. The rise of digital and social media platforms has enabled increased consumer engagement, feedback, and participation in brand narratives. Advertisers continuously adapt to changing consumer behaviours and technological advancements, seeking innovative ways to capture attention and build brand loyalty. POV display mounted on a fan has multiple benefits specifically in the world of advertisements. It provides an affordable, more attractive and an easy installation mode of advertisement which can be utilized by small-scale businesses.

II. LITERATURE REVIEW

Sheikh Rafik Manihar et al,[1] This paper explains the project which is a special kind of circular LED display. The project rotates a whole circuit assembly on a propeller which is powered by a DC motor and a 9V supply to run the motor and the circuit. With the help of the mechanical propeller, LED count, hardware requirement, and hence overall cost is cut to very affordable price. All the synchronizing was implemented through software Ride IDE.

First of its kind, made using the 20-pin 8051 series microcontroller, this project uses the principle of Space Multiplexing. This propeller display mechanically scans using the rotatory motion of the propeller and displays the characters in digital format. This display consists of 7 bright LEDs which are rotated to show the display. For building this project, the requirement is a small 20 pin microcontroller, a position encoder, and LEDs.

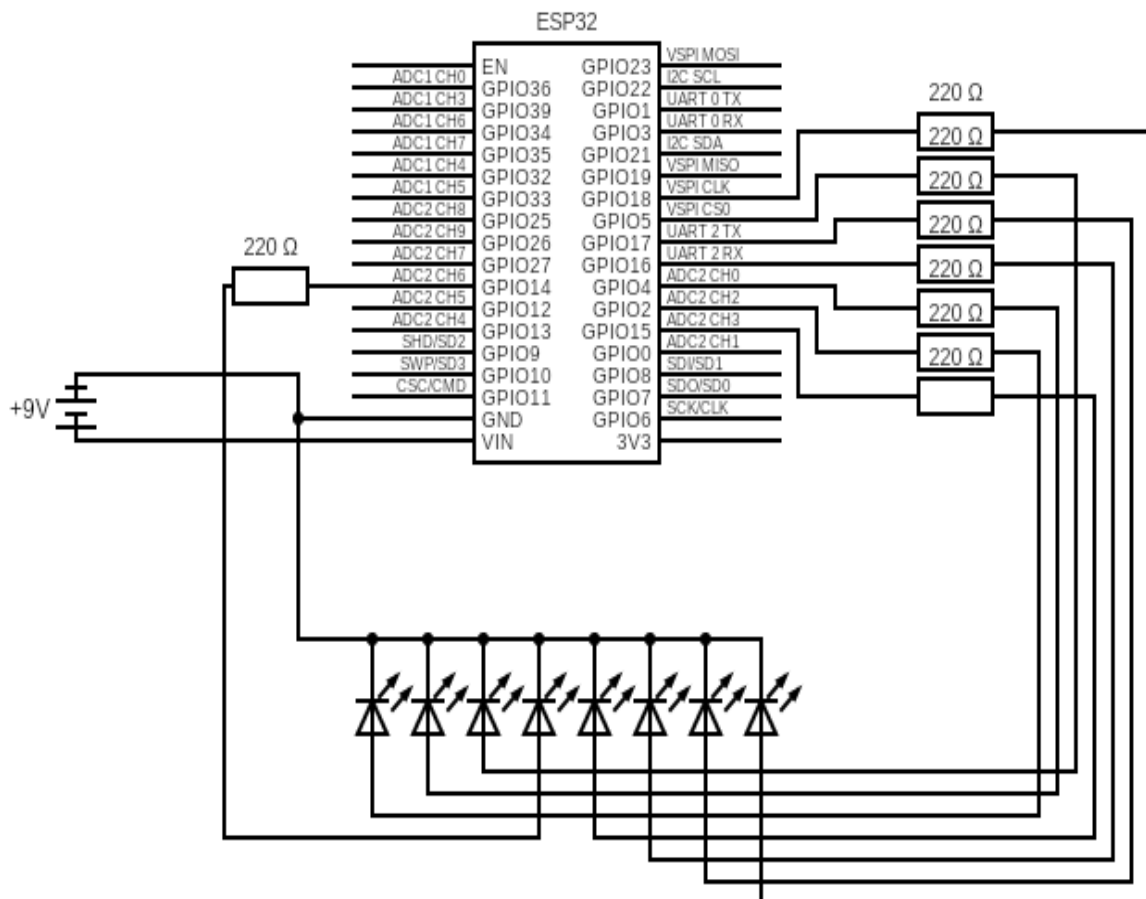
Nikhil Keswaney et al,[2] This project presents yet another type of display, which uses the phenomena of persistence of vision to its advantage. In this project, a single array (column) of LEDs is programmed to glow in a sequence such that when that array is rotated, it displays a certain message. This message is clearly seen only if the array is rotated at a certain speed. This display uses 20 LEDs arranged in a single array (column), soldered upon a rod that is rotated by a motor. This entire project is run by the Arduino uno microcontroller board.

III. METHODOLOGY

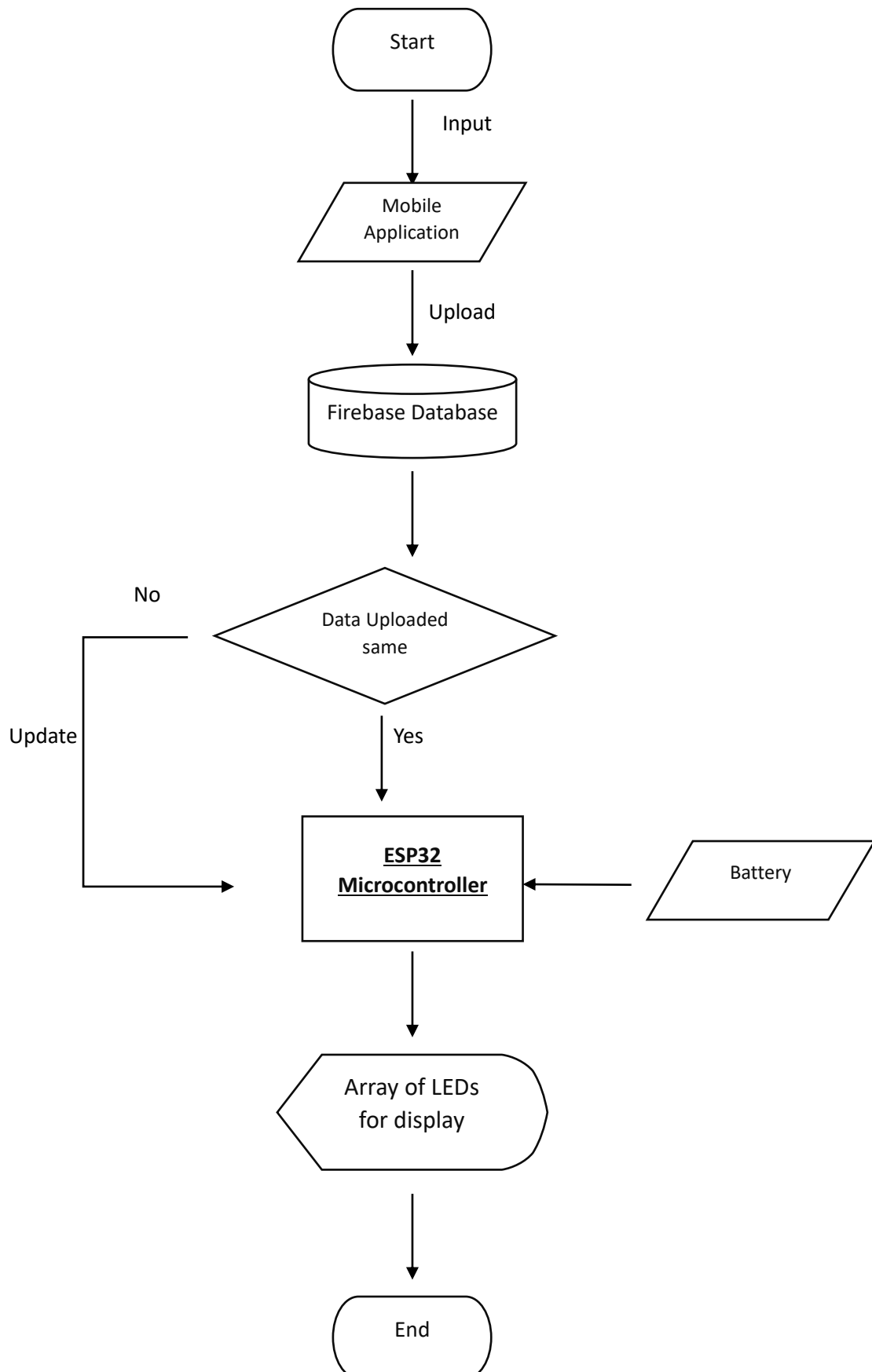
Keeping in mind all the resources available for advertising, we propose a POV display system that will be easy to install by users themselves and one that is cost effective.

The POV display comprises of 8 individual LEDs, a 9V battery and an ESP 32 microcontroller that will act as the brain of the system which is programmed using the Arduino IDE to selectively activate the LEDs thereby giving a very attractive message. This system will be mounted on the blades of the fan. The ESP 32 calculates the rpm of the fan and selectively activates and deactivates the LEDs.

IV. SYSTEM DESIGN



Flowchart



It starts with a mobile app called POV display created using Flutter. Flutter is an open-source UI software development kit (SDK). It uses the Dart programming language and provides a rich set of pre-designed widgets and tools for creating beautiful and responsive user interfaces. The user enters the message that they want to be displayed using the app. The data is sent to the data base. In this case we are using google cloud firebase to store the data from the app.

Incase the data does not match with the input that was given by the user then the firebase updates itself by overwriting the previously stored input. Once the data matches it is then sent to the microcontroller that is the ESP32 which is powered by the batteries.

ESP 32 retrieves the data from the google cloud firebase over wifi. It analyses the data sent and then runs the string in the loop to get each character and then displays the output through the display that consists of 8 individual LEDs. The ESP 32 selectively activates and deactivates the GPIO pins.

Implementation



V. RESULT

- 1) POV display app: The POV (Persistence of Vision) display mobile app offers users a unique way to showcase personalized messages. Built using the powerful Flutter framework, the app provides a seamless user interface and a delightful user experience. Users can easily enter the message they want to display through the app's intuitive interface.
- 2) Google cloud Firebase: When a user enters their desired message into the POV display app, the data is sent to the Google Cloud Firebase database for storage. The app establishes a connection with Firebase, enabling the seamless transmission of data between the user's device and the cloud database.

- 3) ESP 32 Microcontroller: The microcontroller retrieves the data from the firebase. The ESP 32 runs a string in a loop. Allowing the microcontroller to iterate through each character of the string and perform the necessary operations.
- 4) Display: The display consists of the 8 individual LEDs. Each LED represents a specific character or piece of information. By selectively activating and deactivating the GPIO (General Purpose Input Output) pins, the ESP 32 can control which LEDs are illuminated, effectively displaying the output.

VI. CONCLUSION

The development of a POV display mounted on a fan blade offers a captivating and dynamic visual experience. By leveraging persistence of vision, the display creates an illusion of continuous images or patterns as the fan spins, resulting in a visually striking effect. Throughout the project, careful planning and requirements gathering are essential to ensure the display meets the intended objectives and user expectations. Extensive research and component selection enable the identification of suitable hardware, including microcontrollers, and LEDs while considering factors such as brightness, power consumption, and motion detection.

VII. FUTURE SCOPE

Adding wireless Communication capabilities to the expanding the color capabilities of the POV display by incorporating multicolor LED's or RGB LED's can enable the creation of more vibrant and visually striking displays. This opens possibilities for displaying complex patterns, gradients and animations with a broader color spectrum. POV display opens opportunities for real-time content updates, remote control and interactive features, allowing user to customize and personalize their display experience. Integrating the POV display into Internet of Things(IoT) and smart home system can enhance it's functionality. Future developments can focus on optimizing the power consumption and energy efficiency of the POV display system.

ACKNOWLEDGEMENT

It is our privilege to express our sincerest regards to our project guide, **Prof. Devendra Sutar**, Assistant Professor, Goa College of Engineering for his valuable inputs, able guidance, encouragement, whole-hearted cooperation and constructive criticism throughout the duration of project. We deeply extend our sincere thanks to **Dr. Krupashankara M. S.**, Principal, Goa College of Engineering, **Dr. H.G. Virani**, Head of Department, E & TC Dept for encouraging and allowing us to present and conduct the project at their premises for partial fulfilment of the requirements for the project. We take this opportunity to thank all our teachers, laboratory assistants and non-teaching staff who have directly or indirectly helped our project. We pay our respects and love to our parents and friends for their love and encouragement throughout our career.

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