

Automation of restrooms on the highways: STOPOVERS

K.Ramyaharika¹, G.Pravallika², Monika³, K.Navyasree⁴, Ms.M Phani Anusha⁵

UG Students, KKR & KSR Institute of Technology and Sciences, Guntur, Andhra Pradesh¹⁻⁴

Associate Professor, KKR & KSR Institute of Technology and Sciences, Guntur, Andhra Pradesh⁵

Abstract: A basic yet vital component in the tourism industry that can make or break the tourist experience is when the tourist has to make use of amenities on roadways. The main motive of the exposition is to contribute perfect stopovers for commuters on freeways. Stopovers are the restrooms that are equally distributed on the highways. Stopovers are the spots where travelers can clear their needs and refuel themselves for the rest of the journey. Every outlet features a toiletry block with clean and hygienic toilets and convenient stores. These stopovers are fully automated for their bill generation and maintenance. Each outlet works with the automated door locking and automated bill generating system. The project is based on IoT concepts utilizing different components like RFID reader, LCD, motor, and a database.

Keywords: Highways,travelers,restrooms,IoT,Automation.

I.INTRODUCTION

The stopover is an initiative to build high-quality public lavatory service. Stopover outlets are strategically located on highways to offer a perfect rest area for travelers. Each outlet features a toiletry block with clean and hygienic toilets that are located adjacent to food courts and tollgates. A rest area is a public facility, located next to a large thoroughfare such as highways at which drivers and passengers can rest, eat or refuel without exiting on to secondary roads. The main agenda of the proposed system is to offer automated all-time restrooms for travelers on highways. For this to happen, the customer is provided with a rechargeable RFID token. The user has to place the RFID token at the entrance which makes the door open. The user gets notified with an SMS specifying his/her entry time. After usage, he/she can make use of the same RFID tag to exit, which notifies the user with an SMS specifying his/her exit time. This time duration would generate the bill accordingly. Customers get notified of their mobile through SMS service. The existing manual pay & use toilets are a bit modified by automation. Token-based door automation would also provide security for users. Token-based usage offers comfort for customers in terms of usage. The Internet of Things (IoT) is the extension of Internet connectivity into physical devices and everyday objects. Embedded with electronics, Internet connectivity, and other forms of hardware such as sensors, these devices can communicate and interact with others over the Internet, and they can be remotely monitored and controlled. The definition of the Internet of things has evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems.

IoT also greatly contributes to supply management and observance with ease of control. The worldwide web is greatly used in automation that gives decisions via conservative use of energy. The user can remotely control the door, appliances comfortably, and conveniently anytime. IoT projects have gained prominent support especially in terms of smartness and security. Arduino IoT cloud is an application that helps makers build connected objects in a quick, easy, and secure way. You can connect multiple devices to one another and allow them to exchange real-time data. You can also monitor them from anywhere using a simple user interface. Arduino acts as the brain of the system and processes the data from the sensor. Also, IDE software is needed for Arduino based IoT projects. You need to use ESP8266 WiFi communication between the Arduino and cloud platforms.

II.LITERATURE SURVEY

Different people have different requirements in toilets and these may be related to issues of disability, gender, faith, and age. Toilets are therefore multi-functional and complex spaces for getting dressed, breastfeeding, administrating, medicine, caring and washing. Toilets have a long and radical history in design culture. Twenty-first-century toilets need to reflect current and cutting edge thinking on space, accessibility, and design. Accessible spaces can be innovative, stylish, and creative too. Public toilets should always be about the provision of safe and convenient public amenity. There are a few public toilet automation available across the world. Brand Lavato is one such initiation in Tamilnadu. Lavato is a unique and innovatively refreshing lavatory facility that brings a high quality of hygiene and friendly ambiance at each outlet. Lavato is a concept to bring public lavatory services with a complete focus on hygiene

standards and convenience for travelers in India. This work presented an in-depth analysis of the provision of hygienic public toilets for Indian travelers. This paved way for the idea of the development of premium quality restrooms on highways. This work presented an in-depth knowledge of the operation and maintenance of the services.

III. EXISTING SYSTEM

Proper maintenance of public toilets has been a major requirement on Indian highways. Public toilets are supposed to be a product of modernization. Public toilets are not cleaned properly and were neglected. Pay to use public toilets were not welcomed because there were plenty of people who could not use them, such as homeless people, for instance. However, other organizations have stepped up to the plate. These outlets were not evenly distributed. They were not completely automated too. This initiated for installing well distributed completely automated restrooms on highways.

Disadvantages

- There are no wayside amenities for long distances
- The existing public toilets offer high-end utility services, yet they consume a lot of areas and would charge a very high amount for usage.
- Needs manual assistance for its maintenance.

IV. PROPOSED SYSTEM

Stopovers can deliver a safer and cleaner environment for public toilet users. As smart toilets, they have equipped with the user-friendly automatically controlled doors, self-cleaning systems and monitoring services that assist in managing hygiene, demand, and security which include

- Automated door locking and unlocking—improving security and reducing operational costs.
- Comfort and safety for all users provided by direct door access to open space allowing for easy public monitoring.
- Timed occupation, minimizing the potential for anti-social behavior including vandalism.
- An almost touchless environment to aid user hygiene.
- Designed to satisfy community demands at the optimum lifestyle cost.

Stopover series of toilets is a great example of what's possible in thoughtful use of technology and toilet design.

- Money.
- Material.
- Versatility.
- Sustainability.
- Personal safety.
- Hygiene.
- Accessibility.

Servo Motor:

A Servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity, and acceleration.[1] It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analog or digital) representing the position commanded for the output shaft.



The motor is paired with some type of encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to

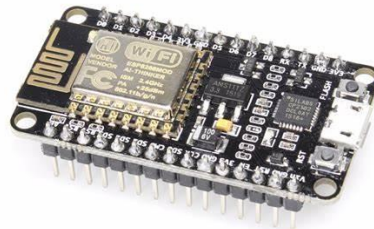
the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero, and the motor stops. Servomotors are used in applications such as robotics, CNC machinery, or automated manufacturing.

RFID Reader:

The EM-18 RFID Reader module operating at 125kHz is an inexpensive solution for your RFID based application. The Reader module comes with an on-chip antenna and can be powered up with a 5V power supply. Power-up the module and connect the transmit pin of the module to receive the pin of your microcontroller. Show your card within the reading distance and the card number is thrown at the output. Optionally the module can be configured for also a weigand output.

**NodeMCU:**

NodeMCU is an open-source IoT platform. It includes firmware that runs on the ESP8266 WiFiSoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua and built on the Espressif Non-OS SDK for ESP8266. It uses many open source.

**ESP8266 Arduino Core:**

As Arduino.cc began developing new MCU boards based on non-AVR processors like the ARM/SAM MCU and used in the Arduino Due, they needed to modify the Arduino IDE so that it would be relatively easy to change the IDE to support alternate toolchains to allow Arduino C/C++ to be compiled for these new processors [2]. They did this with the introduction of the Board Manager and the SAM Core. A "core" is the collection of software components required by the Board Manager and the Arduino IDE to compile an Arduino C/C++ source file for the target MCU's machine language. Some ESP8266 enthusiasts developed an Arduino core for the ESP8266 WiFiSoC, popularly called the "ESP8266 Core for the Arduino IDE". This has become a leading software development platform for the various ESP8266-based modules and development boards, including NodeMCUs.

Working model and procedure:

The user is provided with a rechargeable RFID token to access the restroom. The servo motor attached to the door senses the valid user and allows the door to open which immediately generates an SMS to the user's mobile. After the usage, the user will make use of his card to get out of the room by clearing the bill that is automatically generated according to the time spent by the user. This way, the whole process is quite friendly for the user. There will not be any need for manual assistance here in this project.

V.RESULTS OR WORKING PROTOTYPE



VI. CONCLUSIONS AND FUTURE ENHANCEMENTS

The entire idea has been developed and implemented as per the requirements stated by the user. It provides safety and security. It allows automated user access to the room through an entry card. So, our project is feasible for coming versions, which are planned to develop in the future. Therefore, the conclusion of the proposed system is based on the user's need and is user-centered. The system is developed in considering all issues related to all users which are included in this system. A wide range of people can use this application since it is very user friendly. Various issues related to public toilet Service will be solved by providing them with a fullfledged system. Thus, the implementation of public lavatory services is done to help and solve one of the major problems of people. The future directions of our project are to automatic vending machines that would meet the necessities of the road travelers with the same locking mechanism.

REFERENCES

- [1]. Jonathan Oxer, Hugh Blemings "Practical Arduino-cool projects for open source hardware"
- [2]. Simon monk "30 ARDUINO PROJECTS for the EVIL GENIUS"
- [3]. Matsuura, Craig, Greg Cooper, and Thomas Leishman. "Home automation security system and method." U.S. Patent Application No. 12/098,308.
- [4]. Matsuura C, Cooper G, Leishman T, inventors; Control4 Corp, assignee. Home automation security system and method. The United States patent application US 12/098,308. 2010 Dec 23.
- [5]. Kamelia, Lia, et al. "Door-automation system using bluetooth-based android for mobile phone." ARPN Journal of Engineering and Applied Sciences 9.10 (2014): 1759-1762