Wifi Enable Smart Door and Smart Switches Locked by Using Iot

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Abstract:

An IoT and GPS enabled door lock prototype is presented in this paper. As a convenience feature, the door lock system should not require manual input from the user. It should also be secure. A ESP8266 microcontroller is used as the system's main component, along with a TIP102 transistor to control a 12 VDC solenoid, and an Xbee module to communicate with the host smart home system and receive GPS location information. This paper covers the design of a prototype for an IoT and GPS enabled door lock system. The goal of this research is to design a door lock system that does not require manual input from the user for convenience purposes, while remaining secure. The system consists of ESP8266 microcontroller as its core, TIP102 transistor that controls 12 VDC solenoid, and Xbee module to communicate with the smart home's host and receive status regarding the user's GPS position.

Keywords—Internet of Things; smart home; smart lock.

I. INTRODUCTION

Internet of Things (IoT) is a concept that revolves around a global information network consisting of "things" such as intelligent devices, sensors and actuators, and even smaller networks with their own identity and the ability to configure themselves and make their own decisions to meet to some extent. either individually or collectively [12]. The advent of the IoT heralds the future where everything and everyone will be connected to the Internet through any device they own, be it computers, smartphones, and other consumer devices. Various communication technologies such as WiFi, Bluetooth, near field communication and many more. One of the most common uses of IoT technology is to support a smart home system. Newer smart home systems are a good model for how an IoT architecture, such as in a house, is wirelessly connected to a gateway in order to communicate with each other and with the residents of the house. The home system is supposed to improve the quality of life of the residents in terms of comfort, the IoT is used to at least control and monitor home devices more easily. Functionality: healthcare, entertainment, energy and / or security [3]. Among these functionalities, security becomes one of the most important factors when installing the system. Improving home security through smart home use can be done in a number of ways, including but not limited to installing custom smart door locks. There have already been several examples of the implementation of intelligent door locks, such as camera-based door security systems [46], passwords [67], smart cards [8] and proximity or location detection [9]. Each of the above methods has its own strengths and weaknesses, such as the interoperability value of the devices. In this research, a GPS-based intelligent door lock is developed. The ultimate goal of this research is to design a door with a locking system that does so with no manual input required. However, the scope of this post is limited to examining the feasibility of using GPS for location-based locking to achieve the above goal, and the scope of this document is mainly limited to hardware-based locking while the server and Android app Code that handles GPS tracking are only briefly explained. This device is part of the MINDS smart home system developed by us, which also includes an RGB lamp [10], a curtain control [11], a humidity and temperature sensor [12], a fan control [13] and an infrared Includes remote control [14]. The Smart Home is controlled via the Android-based application described in [15].

II. SYSTEM DESIGN

Research Limitation As mentioned above, this work focuses more on the hardware part, including the defined diagram block, electronic circuit and its assembly, while briefly introducing the software part, which includes the system flow diagram, Android applications and the server, and will be worked out in detail. for other publications. The test limit in the bump test (locked and unlocked state) and power consumption measurement with a digital multimeter. Further key performance indicators will be examined in the future. The architecture is similar to other devices designed for the aforementioned smart home. The intelligent door lock is one of the nodes supported by the MINDS system, which is connected to a Raspberry-based host that acts as a "bridge" for the nodes to receive commands from the user device in the form of an Android-based smartphone Bluetooth or internal et (via cloud server) connected to the The architecture of the MINDS system is shown in the figure. Hardware design The door lock functions as an on / off switch that is controlled based on the user's proximity to the door. The core of the STM32L100 microcontroller used to control the 12 VDC / 630 mA solenoid valve and an Xbee module to receive signals from the central host. The solenoid is controlled by TIP transistor 102 using its shutdown and saturation mode to change the state of the solenoid.In addition, the system is equipped with components such as DC power connector, micro USB connector for development purposes, reset and mode switches and buttons. The solenoid control is shown in fig. Since the transistor must operate in the saturation and blocking regions, the value of components such as resistance must be determined in such a way that they can support these regions of operation. According to data sheet TIP 102, the base current (IB) for the saturation range is 1.9 mA. Therefore, to get the current, equation (1) is used to calculate the value of the base resistance.

$$I_B = \frac{Vout-VBE}{RBasic} \ldots\ldots (1)$$

The Vout value is based on the voltage on the output port of the STM32L100 which is 3.3 VDC, while the voltage between the base and emitter ports of the transistor is based on the Darlington configuration of the transistor, which is 1.4 VDC (0.7 VDC + 0.7 VDC.). From the calculation it can be deduced that a 1 kΩ resistor is required to convert the base current to 1.9 mA. In addition to the base current, the maximum power that the transistor can handle must also be taken into account, especially when the magnet The transistor is noisy Datasheet able to handle 80 watts of power dissipation, assuming the ECV during saturation is 2 VDC then the solenoid power is.

System workflow

This section describes two separate programs that are required to operate the lock: the firmware in the microcontroller and the cell phone software (Android) to transmit the user's GPS coordinates to the host. while the flow chart for the Android application in Fig.

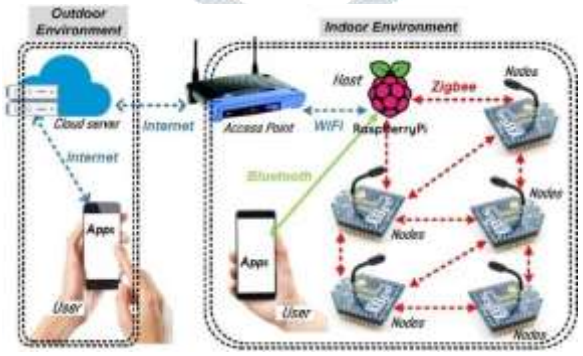

Fig. 1. Architecture of MINDS Smart Home System

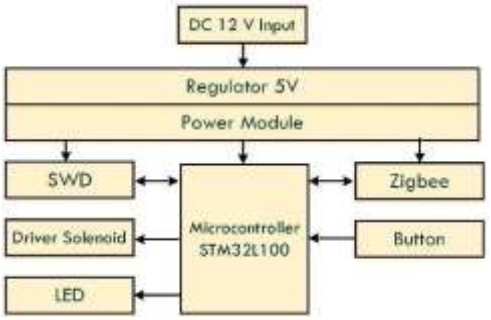

Fig. 2. Block Diagram of the Door Lock System

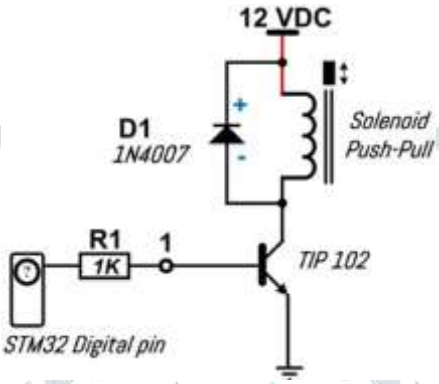

fig. 3. Circuit Diagram for the Solenoid Control.

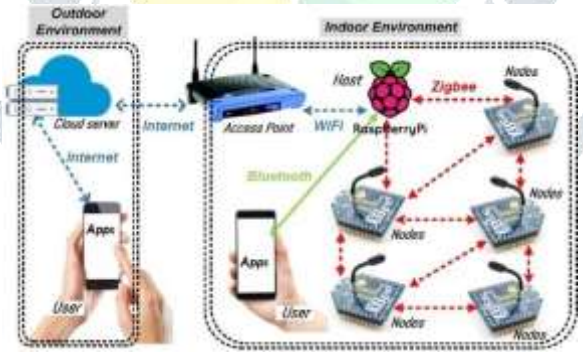

Fig. 4. Flowchart for Firmware for the Door Lock Control.

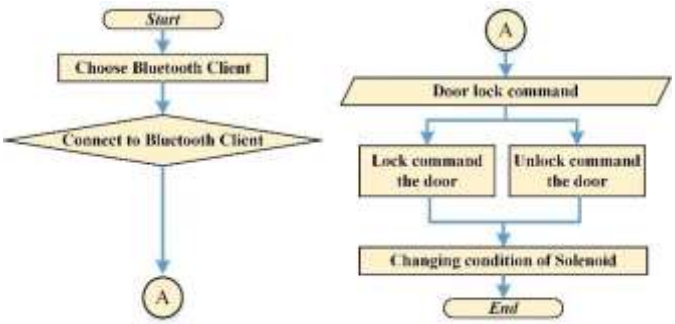

Fig. 5. Flowchart for Android Application for Door Lock Control, Reproduced from [15] under Permission

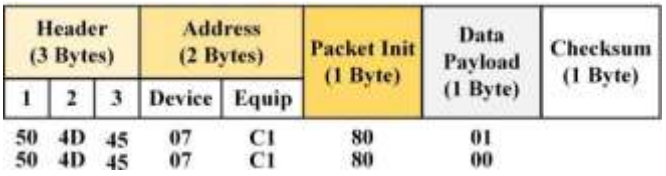

Fig. 6. Packet Data Structure for Door Lock Control, Reproduced from [16- 17] under Permission

A) Protocol design

The message protocol used to transmit GPS data to the host is based on the protocol developed in [16]. The specific message structure for the door lock control is shown in Figure 6 (consisting of packet header, address, packet start, data payload and checksum)

B) Android app and layout

The door lock works with the Android app, which serves as the user interface of the entire MINDS system to periodically detect the user's GPS coordinates and then send them to the server (and host) to compare them with the coordinates. When the distance is 10 meters or less, the application sends an unlock command to the server server the house, which is transmitted to the host and then to the lock hardware. The distance from the user to the house is more than 10 meters, then the system will be locked. The system sends an alert if an unauthorized attempt is made to access the device inside the house while the house is locked.

CONCLUSION

Location-based smart door lock system is the subject of this paper. As a result of a mobile application that captures a user's GPS coordinate, the central host of a smart home system is notified of the user's proximity to the designated GPS coordinates of the door. Tests conducted have shown that GPS coordinates are capable of being used to control door locks. For the system to improve in terms of power efficiency, tracking of areas and indoor accuracy, as well as to increase its security, further research is needed.

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