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Arduino-based Automatic Greeting with PIR Sensor at Angkringan Mukti Kebumen

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Abstract

A waiter is a team member in a restaurant or store responsible for welcoming new arrivals or seeing off departing customers, particularly at the main entrance of the establishment. Currently, the process of welcoming customers relies entirely on human workers, which consumes both time and effort. Therefore, an automated welcoming system is needed to enhance efficiency in terms of time and energy. In this study, the research and development method is employed. The automated welcoming system is built on Arduino technology, involving the use of PIR sensors, Arduino Uno R3, DFPlayer, and a Speaker. During the testing of this product, PIR sensors are utilized as human motion detectors. Arduino Uno R3 functions as the brain of the system, receiving data from the PIR sensors. When the first PIR sensor detects motion, Arduino Uno R3 activates the DFPlayer to play sound through the Speaker. If the second PIR sensor detects motion, the first PIR sensor is turned off for 3 seconds. This product has the capability to detect motion up to a maximum distance of 3 meters.

Keywords: Information System, Parking Information System, Waterfall

Abstrak

Waiter adalah seorang anggota tim di restoran atau toko yang bertugas untuk menyambut pengunjung yang baru datang atau pergi, terutama di depan pintu utama tempat tersebut. Saat ini, proses penyambutan pengunjung masih bergantung sepenuhnya pada pekerja manusia, yang memerlukan waktu dan tenaga. Oleh karena itu, diperlukan sistem penyambutan otomatis untuk meningkatkan efisiensi dalam hal waktu dan tenaga yang digunakan. Dalam penelitian ini, metode yang digunakan adalah Research & Development. Sistem penyambutan otomatis ini didasarkan pada teknologi Arduino dan melibatkan penggunaan Sensor PIR, Arduino Uno R3, DFplayer, dan Speaker. Dalam pengujian produk ini, Sensor PIR digunakan sebagai alat pendeteksi gerakan manusia. Arduino Uno R3 berfungsi sebagai otak dari sistem, yang menerima data dari Sensor PIR. Ketika Sensor PIR pertama mendeteksi gerakan, Arduino Uno R3 akan mengaktifkan DFplayer untuk memutar suara melalui Speaker. Jika Sensor PIR kedua mendeteksi gerakan, maka Sensor PIR pertama akan dimatikan selama 3 detik. Produk ini memiliki kemampuan mendeteksi gerakan hingga jarak maksimal 3 meter.

***Kata-kata kunci**: Sistem Informasi, Sistem Informasi Parkir, Waterfall*

1. Introduction

Restaurant is a term derived from the Latin "restaurare" and in English translated as "a public eating place," which refers to a public eating place or eating house. A restaurant as a commercial place that provides food and beverage services to guests properly. Restaurants usually have staff such as waiters, bartenders, and chefs **[1]** . Waiters/waitresses are staff who work in restaurants, bars and similar establishments. Their main task is to provide professional services in terms of food and beverages to customers **[2]**. By communicating well, waiters can identify and fulfill customers' wants and needs quickly. Therefore, restaurant waiters must have the ability to serve customers well and satisfactorily.

A welcome is an expression or greeting given to someone who is present in a place with the aim of making the person received feel more comfortable or appreciated. Angkringan Mukti Kebumen is a restaurant with the concept of Angkringan, including in terms of menu, atmosphere, and layout. Currently, this restaurant still relies on waiters in its service to visitors who come and go. However, this approach proves to be less efficient as it requires waiter labor. Therefore, the proposed solution is to upgrade the automated greeting system to improve the efficiency and performance of the waiters.

Arduino is an electronic kit or electronic circuit board that is open source. Inside there is a main component in the form of a microcontroller chip with the AVR type produced by the Atmel company. Microcontroller is a type of chip or IC (integrated circuit) that is usually programmed using a computer **[3] [4]** . The purpose of programming on a microcontroller is to make electronic circuits able to read inputs, process these inputs, and produce outputs as desired. Arduino Uno R3 is presented on **Figure 1**.

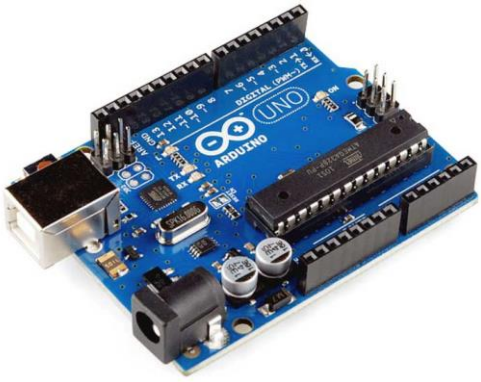

Figure 1. Arduino Uno R3

A PIR (Passive Infrared Receiver) sensor is a device used to identify the presence of infrared radiation. PIR sensors are passive, which means they only receive infrared radiation

coming from the surrounding environment without emitting it. In general, PIR sensors are specifically designed to detect human movement [5]. Sensor PIR is presented on Figure 2.

Figure 2. Sensor PIR

The DFPlayer MP3 module is an audio player device that supports various audio formats, including the commonly used .mp3 files [6]. This module can be accessed easily through serial commands via the TX RX pin. In addition, this module also has the ability to support the use of SD cards with FAT32 format up to 32 GB capacity. DFPlayer is presented on **Figure 3**.

Figure 3. DFPlayer

Speakers are transducers that have the ability to convert electrical signals into audio frequencies, which are sound signals that can be heard by the human ear [7]. This process is done by vibrating the membrane components in the speaker, which then produces sound waves. Sound is actually a number of frequencies that can be heard by the human ear, ranging from 20Hz to 20,000Hz. Sound arises due to fluctuations in air pressure produced by the movement or vibration of a particular object [8]. When the object moves or vibrates, it sends kinetic energy to the surrounding air particles. Speaker is presented on **Figure 4**.

Figure 4. Speaker

2. Method

The research method used uses the R&D/Research and Development method [9] [10] . The research and development steps used are shown in Figure 5.

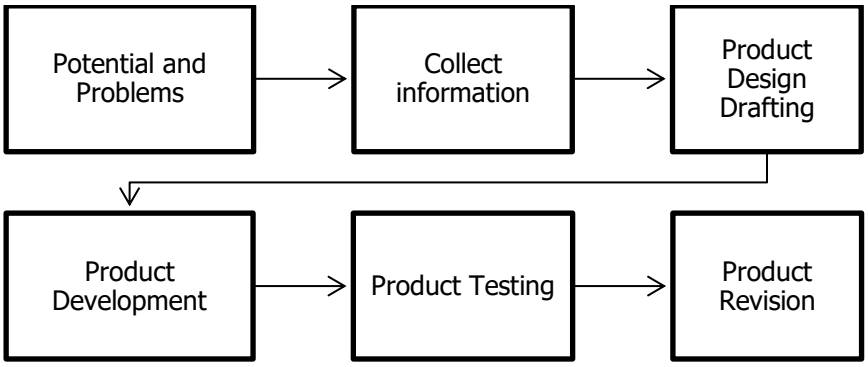

Figure 5. Research Steps

The research method applied was Research and Development (R&D). The research and development steps taken are illustrated in Figure 5. The Research and Development method is used to produce certain products and test the effectiveness of these products.

3. Results and Discussion

Angkringan Mukti Kebumen currently still relies on waiters to greet guests, which causes inefficient use of time and energy. To overcome this problem, it is necessary to implement an automatic welcoming system without the involvement of waiters. The block diagram of the automatic welcome can be seen in Figure 6.

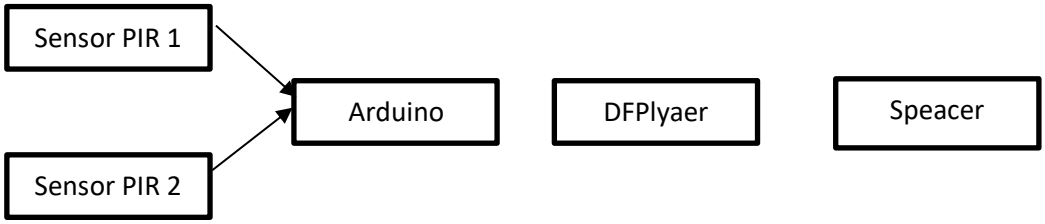

Figure 6. Hardware Block Diagram

Description of the block diagram as follows

a. PIR Sensor Block 1 as a motion sensor
b. PIR Sensor Block 2 as a motion sensor
c. Arduino block as the circuit microcontroller
d. DFPlayer block as a sound reader media that will be used

e. Speaker block as a result of sound output

The operational method of the Arduino-based automatic welcome product with PIR Sensor is as follows: when the system is activated with an electrical power supply, the Arduino Uno microcontroller will start operating according to the program code that has been programmed before. Then, PIR Sensors 1 and 2 will activate, detect motion, and send analog data to the Arduino Uno microcontroller for processing.

When the microcontroller receives analog data from PIR Sensor 1, the Arduino will give a command to the DFPlayer to enable sound playback through the speakers. On the other hand, if the microcontroller receives analog data from PIR Sensor 2, the Arduino will instruct the PIR Sensor to disable itself for 3 seconds. When both PIR Sensors do not detect any motion, the device will return to the preparation state. The entire circuit scheme for this Arduino-based Auto Greet with PIR sensor can be seen in **Figure 7.**

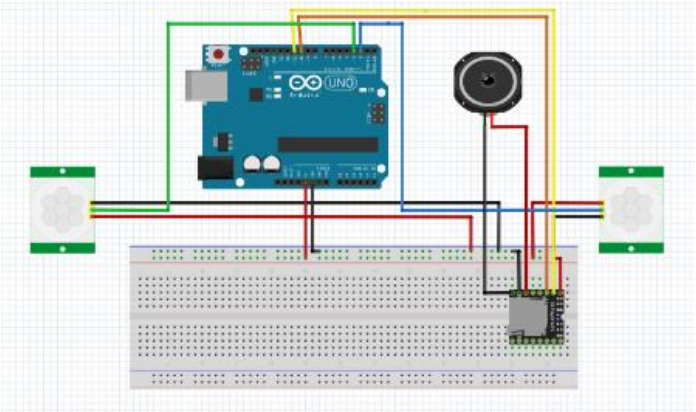

Figure 7. Schematic Results of the Whole System Circuit

The automatic welcome circuit uses Arduino as the core control that regulates all other components. In an automatic welcome product made with Arduino as the main brain, the PIR sensor acts as a means of receiving input data. The connected PIR sensor circuit configuration will send data in digital format to the Arduino for processing, so that the Arduino can run the pre-set program. The PIR sensor functions to detect human movement with body temperature.

In addition, there is a DFPlyer and Speaker as a means of output. After the data from the PIR Sensor is processed by the Arduino, it will activate the DFPlyer to play the file that will be played through the Speaker. This automatic welcome was created to help the waiter's task in welcoming guests, thus increasing efficiency in terms of time and effort required in their work.

This automatic welcome system is designed to detect individuals up to 3 meters away, and if detected, the Speaker will automatically provide a welcome. The test results can be found in **Table 1**.

Table 1. Tool Testing

No.	Distance	Condition
1.	0 Meter	Detected
2.	1 Meter	Detected
3.	2 Meter	Detected
4.	3 Meter	Detected
5.	4 Meter	Not detected
6.	5 Meter	Not detected
7.	6 Meter	Not detected
8.	7 Meter	Not detected
9.	8 Meter	Not detected
10.	9 Meter	Not detected
11.	10 Meter	Not detected

Temperature testing is carried out periodically every 1 meter until it reaches a distance of 10 meters, with data collection carried out 11 times. Based on the information listed in Table 1 of the tool test results, this product can detect temperatures up to a distance of 3 meters.

4. Conclusion

Based of the observation and testing of the tool, it can be concluded that this automatic welcome can be made using an Arduino Uno R3 microcontroller equipped with 2 PIR sensors to detect motion, as well as a DFPlayer and speaker as its output. This tool is able to detect motion within a distance range of 0 to 3 meters. It is hoped that the use of this Arduino-based automatic welcome can help waiters in providing welcome to guests more easily.

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