Design and Implementation of Counter System using Arduino Wireless Motion Sensor

Ahmed ChalakShakir*1 and Najmadin WahidBoskany*2

1Computer Science Department, Faculty of Science, University of Kirkuk, Iraq, 009647701343300, ahhmed_nlp79@yahoo.com.

2Computer Science Department, Faculty of Science and Science Education, University of Sulaimani, Kurdistan Region- Iraq, 00964 (0) 7701581600, boskany@hotmail.com

ABSTRACT

In this paper, the design and implementation of an automatic object counting system has been proposed. Estimating the number of any moving object like people or cars in a crowded environment is an important task in civilian surveillance. We propose a system which depends on real physical wireless sensors for counting different types of objects depending on their motion. The goal is to design and implement a system to monitor places which they have critical situations for overwhelming load, and notifying care giver about this situation.

Keywords: Wireless photo Sensor (LDR Light Dependent Resister), Motion Sensor, Arduino, and Object Monitoring.

I INTRODUCTION

Arduino project was started in Italy to develop low cost hardware for interaction design. It is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board. It is based on the ATmega328 that has 14 digital I/O pins. Among these pins, six of them may be used as Pulse Width Modulation (PWM) outputs, one as a 16 MHZ crystal oscillator, 6 as analogue input, one as a USB connection, one as an In-Circuit Serial Programming (ICSP) header, and one as a power jack and reset button. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. [2]. Where aWireless sensor node is an electronic device of small dimensions that gathers metrics from the environment and transmits the data wirelessly utilizing different networks [1]. Recently, this microcontroller which is simply shown in figure 1 is widely used in many applications and paved the way towards controlling everything through it. This is because it characterized by these properties (Inexpensive, Cross-platform simple, clear programming environment, Open source and extensible software, and Open source and extensible hardware). Object counting is one of the important problems that exists in many environments, for that reason the proposed system is designed to solve this problem utilizing Arduino microcontroller and can be easily exploited in any place that needs counting and has problem in this area. Finally it
can be seen that People (object) observation and counting is of importance in numerous commercial and non-commercial situations. The number of people incoming and departure shops, the occupancy of office buildings or the passenger count of traveler trains provide useful information to shop sellers and marketers, in some places (i.e., like sensitive meeting sessions) when people sneak up behind your back and you cannot hear those people approaching you, security officials or train operators and so forth [4].

**II RELATED WORK AND BACKGROUND**

In [4] the author presents algorithms that address the people counting problem by interpreting the infrared sensor signal as system state. For custom-development of the sensor nodes, the Arduino platform was used as it provides a configurable and programmable processor board which has these properties Name: Arduino UNO Microcontroller: ATmega328 Operating Voltage: 5V Flash Memory: 32KB, SRAM: 2KB EEPROM: 1KB Clock Speed: 16MHz.

In [7] the author in his project presents a smart house by implementing and controlling electronic devices at home remotely and to get an alert on intrusion or movement around the restricted premises. The devices were controlled by a mobile phone using the SMS service available and the alerts were also received as an SMS mentioning the activity occurring around the premises.

**III SYSTEM ARCHITECTURE**

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button [6]. In the proposed system we used (both of Arduino C editor and the C# as a programming language). For the first time we used the simulator called (Proteus 8 professional) in order to simulate our system and for one microcontroller figure 2 is depicting simulated system design.
But the actual design is for one microcontroller and is shown in figure 3.

The design of our system can be used until 6 inputs analog, and this design is causing a problem of delay between the information arrivals to the PC. This problem is solved by merging all the inputs inside one array or one string (parallel processing) then sending them to the PC. For this reason in this case we used C# programming language. It is solved by the following simple code written in the PC side as shown in figure 4:
Figure 4: The C# code for solving the delay problem

But the code in the other side (i.e.; in the microcontroller side) is shown in figure 5.

```csharp
private void timer1_Tick(object sender, EventArgs e)
{
    SerialPort activeSerial = new SerialPort("com4", 9600, Parity.None, 8, StopBits.One); //Change COM4 to your arduino port
    activeSerial.ReadBufferSize = 128;
    activeSerial.Open();
    activeSerial.Write("t");
    string dataFromArduino = activeSerial.ReadLine();
    string[] a = dataFromArduino.Split(' ');
    label1.Text = a[0];
    label2.Text = a[1];
    label3.Text = a[2];
    label4.Text = a[3];
    label5.Text = a[4];
    label6.Text = a[5];
}
```

Another problem is about the distinguishing between the entrance and exit of object, which is mean that how the system can recognize the object (person) is coming in or going out? Because both of the states are interrupting the laser beam, therefore this interrupting is exploited to solve such problem. This is achieved by putting two lines (laser sensor), one is
for sender and the other is for receiver as shown in figure 2. If the first line is interrupted, that is mean the person is entered, but if the second line is interrupted that is mean the person is going out.

CONCLUSION

Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures kits for building digital devices and interactive objects that can sense and control the physical world. Object counting is one of the most important issues in many environments. Our counting system is designed by using Arduino Uno microcontroller for person counting which can be easily developed for any other object counting rather than person. One of the main problems in the used microcontroller is the delay of processing (serial processing). This problem is solved by integrating all the inputs inside one array or one string to be processed in parallel way then sending them to the PC. Also the problem of distinguishing between the entrance and existence persons is solved by using two lines to be interrupted one for incoming and the other is for outgoing.

REFERENCES