Multi-Level Automatic Car Parking With IR Card Security System

Kamrul Hassan, Md. Mustafizur Rahman, Fatema-Tuz-Zohra, Mohammad Sakib Hossain, R.M.M.Hasan

Abstract— To cope with the increasing population of Developing Countries the transportation section are now in an alarming position. Thus traffic jam becomes a vital concern to get an efficient output through some fruit full steps. With this goal developed countries are now adopting some project. Automation plays an increasingly important role in enhancing the betterment of daily experience. As such, it is vital that those in engineering fields understand the technologies associated with this area. Multi-Level Automatic car parking system is now looking feasible to adopt more easily. This project will include the design and construction of a Microcontroller based Multi-Level automatic car parking system .This system is now looking feasible to adopt more easily. Developing countries like Bangladesh can really think about this as this project is under investigation and research to make easier to install and use. This system builds upon topics learned in this course. A working system will ultimately be demonstrated to validate the design. Thus we have chosen to build an idea about this fact to have a worry free transportation system by using IR card security system. We are using IR because it's cheap, does not require manual inspection or optical scanning and its interrogators can be integrated with IT infrastructure (databases, etc).

Index Terms—Introduction, Methodology, Adopted Technique, Design and Simulation, Structural Design, Hardware Implementation and Testing, Conclusion.

1 INTRODUCTION

Traffic jam is a long line of vehicles that cannot move forward because there is too much traffic or because the road is blocked by something. Many cities with equally high population density have mitigated such congestion problems. True that many of these countries are rich and can afford to implement solutions that are not all feasible for a country like Bangladesh. And yet with a strong government desire and well thought out plan that takes into consideration of a futuristic plan is still within our reach to solve this problem in our lifetime.

Traffic jam is common phenomenon in our country especially in big cities like Dhaka, Chittagong and other divisional town area. It is not a problem now a day rather it is more than a problem because problem has some solutions that traffic jam has not. Time is the most valuable thing in the twenty first century no doubt. And traffic jam is killing the most productive time of the people of big cities of Bangladesh.number. Click the forward arrow in the pop-up tool bar to modify the header or footer on subsequent pages.

In Dhaka City Corporation there are around 7 million people and in Dhaka metropolitan there are more than 12 million people. In this mega city, people on an average spend 2.35 hours in the traffic of which 1.30 hours are Due to traffic jam. It means they are losing 1.30 hours every day due to traffic jam. They are losing 1.30 men

Hour of resource every day. It means it takes more than double transportation time.

People are losing 55% of their traffic hour during staying in the traffic.

This time into valuable work that might add something to our economy. [1]

The term automatic car parking system is new in our country, but the system is already adopted in modern mega cities like Singapore, koalalampur, Manila, Jakararta, Bangkok, Hong Kong, Shanghai

Installation of such system has become a crying need for all mega cities, where lack of adequate parking spaces, ignorance and violation of traffic rules and a growing number of vehicles hitting the roads are worsening the traffic congestion day by day.

This Automatic Car Parking enables the parking of vehicles-floor after floor and thus reducing the space used. Here any number of cars can be park according to requirement. The salient features of the systems are space-saving, Time saving, High efficiency, Car safety, Environment friendly.

2 METHODOLOG

2.1 Introduction

Methodology to accomplish any project may involves the steps are shown in the following block diagram.

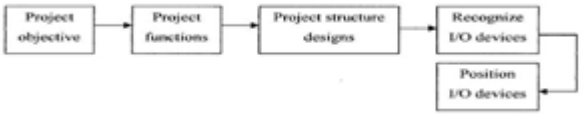

Fig. 1. Block diagram of the stages design a project.

2.2 Methodology of automatic car parking system

Methodology of this prototype automatic car parking system mainly classified into two catagories. First one is simulation

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operation and second one is hardware operation. At first we observe the simulation output then making decision for hardware implement.

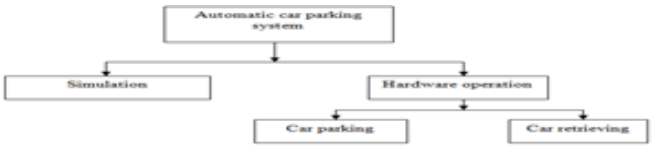

Fig. 2. Methodology of Multi-Level Automatic car parking and it's security system

3 Adopted Technique

3.1 Adopted Technique for Multi-Level Automatic car parking and it's security system

For doing the prototype of Multi-level Automatic car parking ssome technique are adopted. To adope this technique we are concern about overall cosr, efficiency, component avaibility, life time, complexity of operation, initial installment etc. Considering this prescribe concern we are adopt three basic techniques for doing this prototype. Three basic technique are Automation system, Microcontroller and IR

3.2 Automation System

Automation can be defined as a technology concerned with performing a process by means of programmed commands combined with automatic feedback control to ensure proper execution of the instructions. The resulting system is capable of operating without human intervention. The development of this technology has become increasingly dependent on the use of computers and computer-related technologies. Consequently, automated systems have become increasingly sophisticated and complex. Advanced systems represent a level of capability and performance that surpass in many ways the abilities of humans to accomplish the same activities.

3.3 Introduction to Microcontroller

A cheap, universal integrated circuit that could be programmed and used in any field of electronics, device or wherever needed. Technology has been developed enough as well as the market. So it happened, body and spirit were united and the first integrated circuit was designed and called the MICROCONTROLLER.

3.4 Programming Language and Technique

Control unit of microcontroller works with instructions in binary form machine language (16-bit words for AVRs). Compose applications in machine code is extremely infective, complicated, illegible the assembly code is used. Process of translation into machine language is supported by assembler {replace each instruction with binary succession according the defined rules.

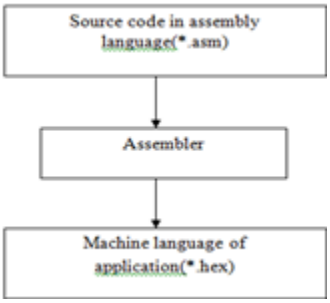

Fig. 3. Process of source code translation

3.5 Introduction to IR transmission and reception

Infrared (IR) light is electromagnetic radiation with longer wavelengths than those of visible light, extending from the nominal red edge of the visible spectrum at 0.74 micrometers (μm) to 300 μm. This range of wavelengths corresponds to a frequency range of approximately 1 to 400 THz. Comparison with other light has been given in table 1.

TABLE 1
COMPARISON OF LIGHT WITH IR [2]

Light comparison			
Name	**wavelength**	**Frequency**	**Photon Energy**
Gamma ray	less than 0.01 nm	more than 10 EHZ	100 keV - 300+ GeV
X-Ray	0.01 nm to 10 nm	30 EHz - 30 PHz	120 eV to 120 keV
Ultraviolet	10 nm - 390 nm	30 PHZ - 790 THz	3 eV to 124 eV
Visible	390 nm - 750 nm	790 THz - 405 THz	1.7 eV - 3.3 eV
Infrared	**750 nm - 1 mm**	**405 THz - 300 GHz**	**1.24 meV - 1.7 eV**
Microwave	1 mm - 1 meter	300 GHz - 300 MHz	1.24 μeV - 1.24 meV
radio	1mm – 100,000km	300 GHz – 3Hz	12.4 feV - 1.24 meV

3.6 Coding for IR transmission and reception

Infrared communication is rather robust against disturbers (e.g. sunlight) using a 38kHz-on-off modulation. In contrast, RF is much more sensitive to noise. Therefore, RF receivers automatically adjust their zero-one-decision threshold (data slicer) based on the incoming data signal. In order to have a well positioned decision level, zero- and one-bits must be deployed in a balanced occurrence. This is implemented by coding the actual payload with codes being free of DC-components. One of the commonly used codes for this purpose is *Manchester* coding which represents each bit of the payload with two consecutive unequal chips. The actual bit-information is represented by the *center edge in the middle* of the two chips. A rising edge relates to a one-bit a falling edge relates to a zero bit (or vice-versa).

One *disadvantage* of Manchester-coding is obvious: Actu-

ally, the number of bits on the channel (called chips) is twice as high then in the payload as each payload bit is represented by two chips. That means that the actual bit rate and bandwidth requirements are twice as high as for encoded data.
The *advantage* of Manchester Coding is that it is free of DC-components.This enables receivers to perfectly adjust the decision threshold between incoming high- and low-levels. Decoding is slightly more difficult in the receiver's microcontroller since the direction of the edge in the middle of each data bit has to be detected (rising or falling). [3]

Fig. 4. Manchester Coding (DC-free)

4 Design and Simulation

4.1 Introduction

Simulation design of a project involves a few stages that need to be taken care of before undertake the planning in actual. The steps are shown in the following block diagram:

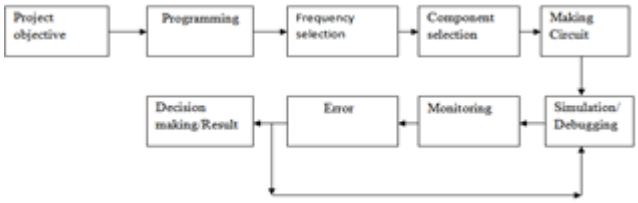

Fig. 5. Block Diagram of the design stages

4.2 Introducing the basic unit of Simulation design

In this simulation design there are few basic block/unit are present. Each unit have individual working function. The basic unit are transmitting unit, receiving unit, display unit, Motor driving unit, oscilloscope unit.

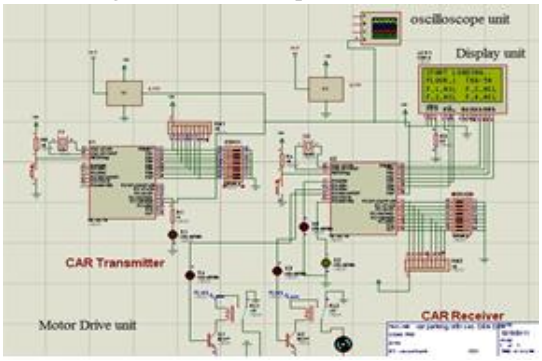

Fig. 6. Overall diagram of Simulation circuit

4.3 Processed bit stream signal for data transmitting and receiving end for IR card security system.

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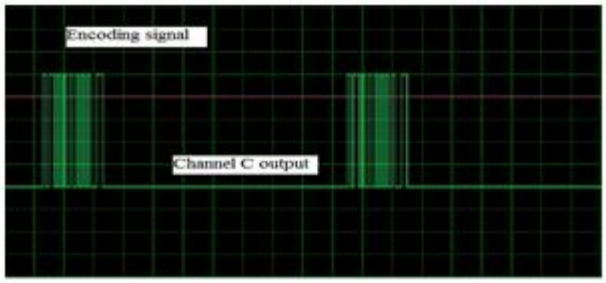

Fig. 7. Encoding bit stream signal from transmitting unit with time division 10 ms

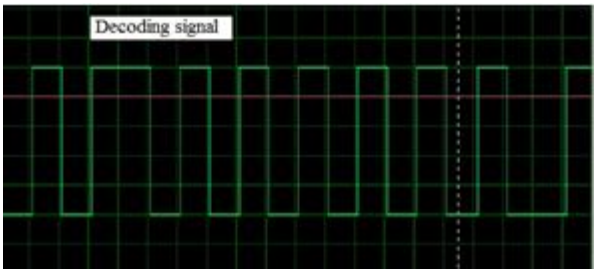

Fig. 8. Decoding bit stream signal from receiving unit with time division 1 ms

5 Structural Design

5.1 Introduction

In our project, we made a demo of four levels Automatic Car Parking System. This project shall be considered as a demonstration type project. The main objective of the project is to develop a four level elevator and conveyer car parking control system by using Microcontroller. The demonstration will be able to show a prototype of scaled-down wood structure where representing a building in

actual environment. The elevator with conveyor belt will be used to accommodate and move cars. The structure is installed with one 24Vgeared DC motor. One motor used as lift hoist motor. In actual environment, the motor shall be a 3-phase high power AC motor. There are control panel and indicator panel beside the wood-structure which is located outside the elevator. There is also an entrance bar in the structure which controls the car entrance. For lift floor since we have used infrared sensor. In order to detect car position at each floor and overweight we have used toggle switch in practical system which will be replaced by pressure sensor or other advanced sensors. In our project we use AutoCAD and Solid works software for making the prototype structure.

5.2 Project Structure

This project shall be considered as a demonstration type project. The main objective of the project is to develop a four level elevator and conveyer car parking control system by using Microcontroller. The demonstration will be able to show a prototype of scaled-down wood structure where representing a building in actual environment. The elevator with conveyor rope will be used to Accommodate and move cars. Fig 9 shows the prototype of this structure with proper scaling.

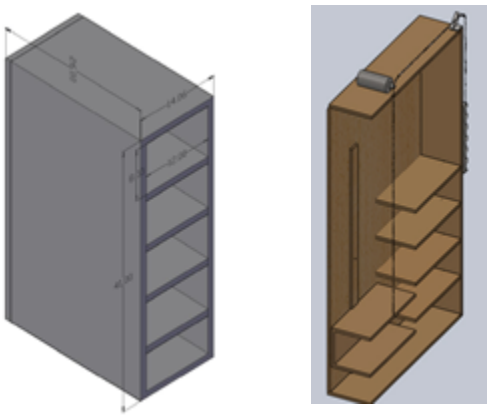

Fig. 9. Layout design and Cross-sectional view of Prototype Multi-level car parking using AutoCAD and Solid works

6 Hardware Implementation and Testing

6.1 Introduction

Hardware implementation is a great challenge for any kind of project. In this prototype Multi-Level Automatic car parking with IR card security system, we are successfully implemented this hardware circuit.

6.2 Hardware Implementation

Hardware implementation are classified some basic units. Such as author transmitting card, receiving unit, Motor drive unit, DC gear motor, balancing the load. The figure no 10 and 11 shows the basic units of the hardware implementation.

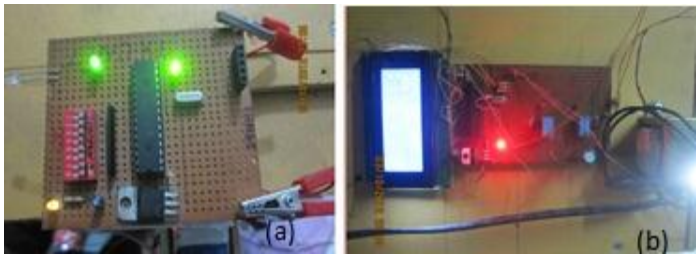

Fig. 10. (a) IR transmitting unit and (b) Control circuit of Multi-Level Automatic car parking system

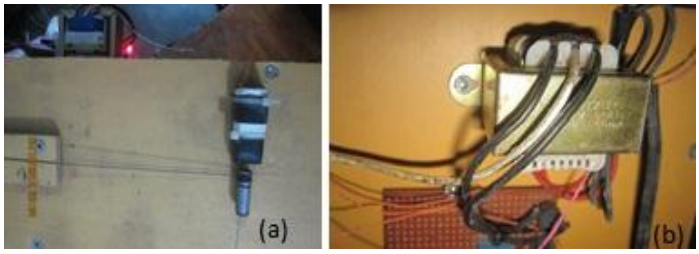

Fig. 11. (a) DC gear motor and (b) Step down transformer of Multi-Level Automatic car parking system

6.3 Overall Performance Test

- **Initial Parking Condition:** To describe the operation test at first for convenience the floor 3 and floor 4 has been occupied car programmatically and the initial display is shown in fig no 12(b) where floor 1 and floor 2 is displayed as NILL. The initial scenery of the parking system is shown in fig no 12(a) where floor 3 and floor 4 is occupied with car and remain floors is empty.

Fig. 12. (a) Initial display and (b) Initial scenery of the parking system

- **Loading The Second Floor:** Then by selecting loading of floor 2 the display in fig no 13(b). The balance is indicate on the display as TKA 54 which is the initial balance in this case. After loading the floor 2 the parking scenario has shown in fig no 13(a).

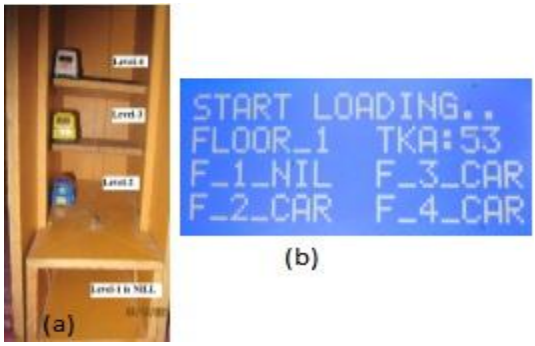

Fig. 13. (a) Loading floor-2 and (b) after loading floor-2

6.4 Concluded Decision

Though this prototype has some certain faults, errors and limitations but the prototype is not beyond the tolerance range. Thus this prototupe is really a convenient representation of a practical multi-level car parking system.

7 Conclusion

7.1 Introduction

The main purpose of our project is to buildup a automatic car parking system demo. To face the challenge of automation in practical, we need a vast knowledge. In this project, we worked with Microcontroller based control system. We also tried to differentiate among different types of automation and control systems. In here we also tried to give proper security of the vehicle. To increase the knowledge about automation, this project will obviously be very helpful. Nonetheless, this project can further be modified or developed any time to offer more flexibilities and facilities

7.2 Conclusion

Bangladesh is a developing country. Automation facilities are still not available in many of our industries because of high initial cost. Although there are some limited industries having automatic control systems, in case of malfunctioning, troubleshootings cannot be handled as per requirements by local engineers. To overcome all these problems, our engineers should have adequate theoretical as well as technical knowledge about all types of automatic control systems.To face the challenge of automation in the industrial field we need vast knowledge. In this project we worked with Microcontroller, IR transmitting and receiving system. To increase the knowledge about automation this project will be helpful to us. This project can be developed any time for more flexibility and facilities

Acknowledgment

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