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IMPLEMENTATION OF EMBEDDED ELEVATOR CONTROL SYSTEM USING BLUETOOTH MODULE

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Abstract*:*

Now-a-days we can find huge number of apartments and commercial buildings crowded in nearby area with multi storage building capacity .The apartments consist of several floors. This paper better suits for all, mainly for physically challenged people. To move from one floor to another we generally use staircase or Elevator which is normally operated by using switches. The main purpose of this paper is to design an elevator wireless adjustment system, which involves android phone technology (Bluetooth) and microcontroller technology.

Key Words*:* Bluetooth Module & Elevator

1. Introduction:

With the overall rapid development taking place in all spheres, the living standard of human being particularly in urban areas has tremendously increased as such the high rise buildings are constructed for malls, and housing purposes. Thus the installation of elevators in these high rise buildings becomes an integral part of the infrastructure for the movement of goods and people. So, the control system is essential in the smooth and safe operation of the elevator. It guides the elevator in what order to stop at floors, when to open or close the door etc. [1-4].

Elevator or lift is a transport device that is very common to us nowadays. We use it every day to move goods or peoples vertically in a high building such as Shopping centre, working office, hotel and many more. It is a very useful device that moves people to the desired floor in the shortest time. This paper dissertation documents the findings and results of a research on an elevator control by using wireless technology (Bluetooth module) and micro-controller. It provides information, which is useful to those who wish to carry out a lift control system research or paper. In this paper, lift control system is going to be produce by using microcontroller. Thus, the main objectives for this paper is to design and construct stepper motor based elevator control by using wireless technology (Bluetooth).There are some scopes which needed to achieve the To design a lift control system by using microcontroller and wireless technology (Bluetooth) to design the program (software) for the overall system according to the real lift traffic management algorithm. To integrate the hardware and software in order to simulate the functions of a basic lift system.

2. Conventional System:

Elevators began as simple rope or chain hoists. An elevator is essentially a platform that is either pulled or pushed up by a mechanical means. A modern day Elevator consists of a cab (also called a "cage" or "car") mounted on a platform within an enclosed space called a shaft or more correctly a hoist way. In the past elevator drive mechanisms were powered by steam and water hydraulic pistons. During the middle ages, the elevator operated by animal and human power or by water-driven mechanisms. The elevator as we know it today was first developed during the 1800s and relied on steam or hydraulic plungers for lifting capability. In the later application, the cab was affixed to a hollow plunger that lowered into an underground cylinder. Liquid, most commonly water, was injected into the cylinder to create pressure and make the plunger elevate the cab, which would simply lower by gravity as the water

was removed. Valves governing the water flow were manipulated by passengers using ropes running through the cab, a system later enhanced with the incorporation of lever controls and pilot valves to regulate cab speed. The granddaddy of today's traction elevators first appeared during the 19th century in the United Kingdom, a lift using a rope running through a pulley and a counterweight tracking along the shaft wall. In the 1800s, with the advent of electricity, the electric motor was integrated into elevator technology by German inventor Werner von Siemens. With the motor mounted at the bottom of the cab, this design employed a gearing scheme to climb shaft walls fitted with racks. By 1903, this design had evolved into the gearless traction electric elevator, allowing hundred plus story buildings to become possible and forever changing the urban landscape. Multi-speed motors replaced the original single-speed models to help with landing-levelling and smoother overall operation. Electromagnet technology replaced manual rope-driven switching and braking. Besides, Push-button controls and various complex signal systems modernized the elevator even further. Safety improvements have been continual, including a notable development by Charles Otis

3. Proposed System:

The Proposed system is to choose a new wireless technology for controlling the position of stepper motor for an elevator system. For wireless technology Bluetooth module is used because Bluetooth wireless technology is becoming a popular standard in the communication arena, and it is one of the fastest growing fields in the wireless technologies. It is convenient, easy to use and has the bandwidth to meet most of today's demands for mobile and personal communications [7-8]. There are different techniques for controlling the stepper motor such as fuzzy logy, neural network and microcontroller. Microcontroller finds a best method for controlling the position of stepper motor. The speed of stepper motor is control by changing the delay time of pulses and control over the position on is done by control the number of pulses. Also unipolar stepper motor is better than a bipolar motor because of the reduced step angle and there is no need of reversal the current in the unipolar drive for changing the rotation of stepper motor. Different types of drives are used to operate the stepper motor because the microcontroller output is not sufficient to operate the stepper motor. Out of all drives ULN2003 is a less costly drive IC for stepper motor. The real time information of the elevator moving through the floors is displayed with the seven segment display. The control program is written in C language and Kiel compiler software is used to change this high level program into HEX code. By using D Scope we can download this HEX code to the 89S51 microcontroller for position control purposes

Bluetooth Module:

Bluetooth operates at frequencies between 2400 and 2483.5 MHz (including guard bands). This is in the globally unlicensed (but not unregulated) Industrial, Scientific and Medical (ISM) 2.4 GHz short-range radio frequency band. Bluetooth uses a radio technology called frequency-hopping spread spectrum. Bluetooth divides transmitted data into packets, and transmits each packet on one of 79 designated Bluetooth channels. Each channel has a bandwidth of 1 MHz Bluetooth 4.0 uses 2 MHz spacing, which accommodates 40 channels. The first channel starts at 2402 MHz and continues up to 2480 MHz in 1 MHz steps. It usually performs 1600 hops per second, with Adaptive Frequency-Hopping (AFH) enabled. A master Bluetooth device can communicate with a maximum of seven devices in a piscinet(an ad-hoc computer network using Bluetooth technology), though not all devices reach this maximum. The devices can switch roles, by agreement, and the slave can become the master (for

example, a headset initiating a connection to a phone necessarily begins as master as initiator of the connection but may subsequently operate as slave).

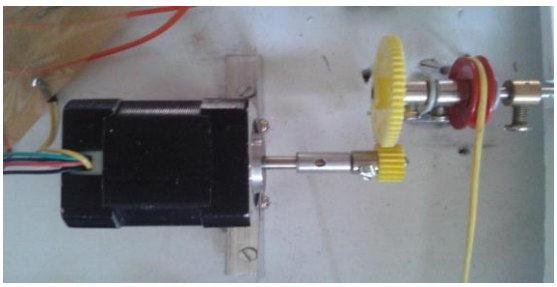

Figure 1: Bluetooth App & Bluetooth Module

ULN2003 Driver for Stepper Motor:

The ULN2003 is a unipolar stepper motor driver. These drivers are inexpensive and with high efficiency. This driver has 16 pins and more efficient than the semiconductor switches based stepper motor drives. These drivers are also lowers the effect of inductance. The microcontroller output pulse is not sufficient to drive the stepper motor [5-6]. So, we used driver to operate the stepper motor. These drivers are more efficient than the drives have semiconductor switches like Transistor, MOSFET and IGBT because their control is simplest than the semiconductor switches. The probability of failure is less and the problem like ULN2004Aare high voltage, high current darling-ton arrays each containing seven open collector darling-ton pairs with common emitters [2]. Each channel rated at 500mAand can withstand peak currents of 600mA. Suppression diodes are included for inductive load driving and the inputs are pinned opposite the outputs to simplify board layout. These versatile devices are useful for driving a wide range of loads including solenoids, relays DC Motors and LED displays filament lamps.

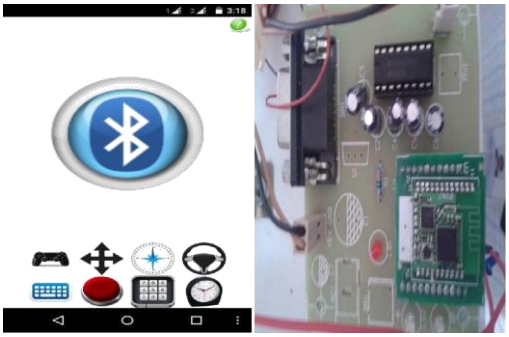

Figure 2: Stepper Motor

Voice Module:

A voice-controlled elevator security system is disclosed. Authorized users provide template voice signals for digital storage in a memory. The user wishing to gain access to the elevator system provides a voice signal by simply reciting one or more of the words stored in the memory. The single template voice signal having the largest number of binary bits in agreement with the binary bits of the user's voice signal is indicated. The number of binary bits in agreement is compared with a predetermined limit and if the number in agreement exceeds this limit, an enable signal indicates.

4. Hardware Requirements:

- ✓ Power supply unit
- ✓ Micro controller
- ✓ Stepper motor
- ✓ Bluetooth module

- ✓ Voice module
- ✓ Seven segment display

Schematic Diagram:

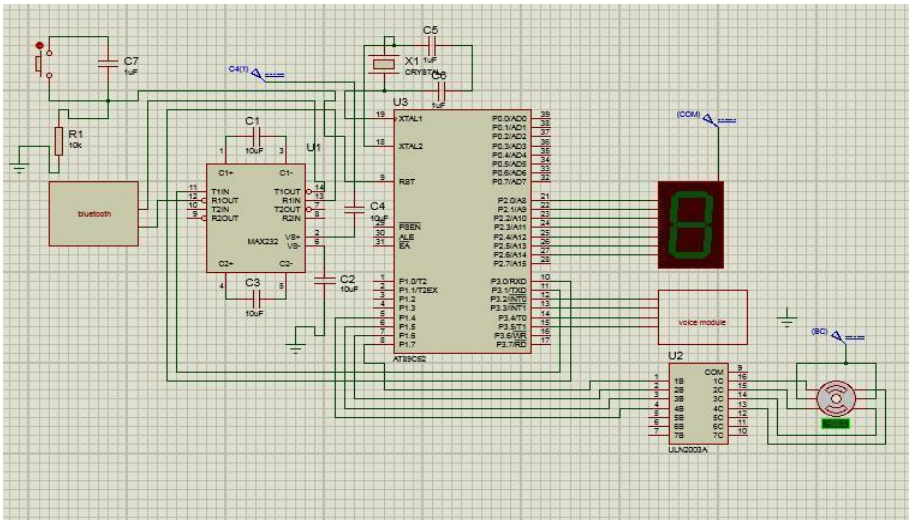

Figure 3: Schematic Diagram

Power Supply Unit:

We initially provide 230v single phase AC supply to the power circuit unit. The step down transformer converts the 230v supply to a 12v AC supply. This 12v supply is given to the bridge rectifier which gives a pulsating DC. The filter circuit connected after the rectifier removes the DC and allows AC. The output of the filter is given to the 7805 regulator which produces 5v DC to the microcontroller. The output of the filter is given to the 7812 regulator which produces 12v DC to the stepper motor.

Seven Segment Display:

The aim of this research is to choose a new wireless technology for controlling the position of stepper motor for an elevator system. For wireless technology Bluetooth module is used because Bluetooth wireless technology is becoming a popular standard in the communication arena, and it is one of the fastest growing fields in the wireless technologies. It is convenient, easy to use and has the bandwidth to meet most of today's demands for mobile and personal communications.

5. Results and Discussion:

Figure 4: Elevator is in First Level

When first level is pressed then based on IR sensors a Voice command is generated when the persons in the lift exceeds a designed limit otherwise the motor runs in condition till the cabinet reaches its required position and actuates the limit switch which enables the motor to stop and if the cabinet is already in the required position then the motor won't get actuated and finally a voice command is generated for indication of floor number.

Again, when for the second level is pressed then based on IR sensors a Voice command is generated when the persons in the lift exceeds a designed limit otherwise then the motor runs either in forward or reversed condition according to its position till the cabinet reaches its required position and actuates the limit switch which enables the motor to stop and if the cabinet is already in the required position then the motor will not get actuated and subsequently it worked successfully for other levels too

Figure 5: Elevator is in Second Level

6. Conclusion:

This paper deals with programming and through it we can display the floors through 7 segment display which the elevator is moving and stops. A voice command is generated at each and every stage of elevator and. If when number of persons in the elevator exceeds the designed limit then it generates a voice command. IR sensors are used to count the number of persons enter into the elevator and exit into the elevator. Bluetooth is used as a wireless technology to transfer data from mobile to the elevator.

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