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Article

# Review on Automated Elevator-an Attentive Elevator to Elevate using Speech Recognition

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## A B S T R A C T

Elevator has over time become an important part of our day-to-day life. It is used as an everyday transport device useful to move goods as well as persons. In the modern world, the city and crowded areas require multiform buildings. According to wheelchair access laws, elevators/ lifts are a must requirement in new multi-stored buildings. The main purpose of this project is to operate the elevator by voice command. The project is operating based on voice, which could help handicap people or dwarf people to travel from one place to another without the help of any other person. The use of a microcontroller is to control different devices and integrate each module, namely- voice module, motor module, and LCD. LCD is used to display the present status of the lift. The reading edge of our project is the "voice recognition system" which genet's exceptional result while recognizing speech.

**Keywords:** Arduino UNO, Smart Elevator, Voice-Controlled, Bluetooth Module, Embedded System

## Introduction

The elevator is very common for us nowadays. The use of elevators is expanding in different applications like those are used in carrying goods and carrying people vertically in tall buildings like offices, shopping malls, and other skyscrapers, with increasing technological advancement the reliability is getting worse. Some inventions are not even portable and require great efforts to handle. Therefore, we have decided to come up with a new idea, which is fascinating, as well as helpful. It tries to make it more automatic through your project Speech recognitions a technology in which the system understand the words but not it meaning of the words. Speech is an ideal best and ideal method for controlling the elevator. Automatic speech recognition is a technique by which a computer takes a speech signal and converts it into words. Microcontroller to gives an appropriate command to all attached devices uses those words.

This paper explains a safety system in the current elevators which would ensure that passengers are safe even if the rope of elevator cage breaks. Elevators are largely used to ease work of human being and reduce the time of traversing up and down a multi-story building. Hence it has become equipment of prime importance. The safety of people in the elevator thus brings us to the idea of developing a low-cost and simple mechanism which can be installed in every elevator ensuring rope breakage safety of the people. In view of the frequent occurrence of elevator accidents, an elevator safety monitoring system based on the Internet of Things (IoT) was designed. First, the requirements of elevator safety monitoring system were analyzed in terms of function and performance, and the

feasibility of the system was evaluated from perspectives of demand, technology, and practical operation. The design scheme of the system was then presented, which combined the Brower/Server (B/S) and Client/Server (C/S) architectures. As the client of the command and control center, the front-end monitoring system communicated and interacted with it and used the standard real-time transport protocol (RTP) for transmission. Finally, the elevator safety monitoring system was implemented. The test showed that the function and performance of the proposed elevator safety monitoring system achieved the designed target of the system and had practical application value.

Elevator system is a highly specialized machinery that requires technicians that have a wider array of knowledge in maintaining the system to be safe and reliable. While attaining reliable data of elevator malfunction become challenges, this study has filled the gap by gathering the management-maintenance issues and operational defects of elevator system. Forty-three types of operation defects were found and the consequence defects and their possible causes of occurrences were discussed. To respond to the prime challenges of maintaining elevator system provided by the industry players‟ perspective, a theoretical framework is established as a recommendation to improve knowledge base of defects in elevator system which comprises good practices, and solutions to rectify each defects found. Hence, this research paper has theoretically improved the knowledge base of maintainability of elevator system and provides meaningful guidelines in practical senses to the industry professionals.

Elevators ease the work human being and keep them in the comfortable zone. One can make the better use of PLC in the designing of the elevator control system. This control is based on the input that is received from the operator as well as from the sensors. Elevator control system is needed to control all the functions of the elevator. It is the one which guides the elevator car, Elevator car is one which actually carries the passengers between the different floors; it also controls the opening and closing of doors at different floor, and the safety switches are also controlled by the elevator control system. The ladder logic programming is used to simulate the proposed system. Because of use of PLC, elevator systems are getting better, faster, stronger and better quality elevators are produced. Hence more importance is given to the design of an elevator control system.

## Different Types of Elevator

The different types of lifts or elevators include building lift, capsule lift, hydraulic elevator, pneumatic elevator, passenger lift, freight elevator, traction elevator/cable driven, residential elevators, machine room-less elevator, etc.

## Hydraulic Elevator

A hydraulic elevator is power-driven by a piston that moves within a cylinder. The piston movement can be done by pumping hydraulic oil to the cylinder. The piston lifts the lift cab easily, and the oil can be controlled by an electrical valve.

The applications of hydraulic elevators involve in five to six-floor buildings. The operating of these elevators can be done at speeds up to 200 ft or 61 meters for each minute. All the current hydraulic pumps are designed with a mechanical Y-delta starter otherwise solid state contractor. For the power supply of motor as well as building, solid-state starters are superior. Because the windings stay longer as well as there is no voltage drop across the building power supply.

**Figure 1.Hydraulic Elevator**

## Hydraulic Elevator

In Y-delta type starter, the motor can be activated by using two contractors on a decreased speed, after that continues with full speed. Older hydraulic elevators now started up suddenly, transmitting mains power at full-blast right into the electric motor. This sets a lot of damage on the motor, which will make it burn out quicker than motors on Solid-State or Y-Delta Contactor starters. The hydraulic elevators are classified into four types such as holed, hole less & roped elevators.

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### Pneumatic Elevator

The pneumatic elevator can be designed with an external cylinder, and the cylinder is a crystal clear self-supporting cylinder. This cylinder includes modular sections to fit effortlessly into one by one. The top of this tube is designed with steel material that ensures tight air shutting by suction valves as well as inlets. A lift car runs within the cylinder, & the head unit on the top cylinder surface consists of valves, controllers, and turbines for controlling the elevator movements.

### Pneumatic Elevator

Pneumatic elevators are very easy to fit, operate as well as maintain when compared with the traditional elevators. These are used in existing homes because of their solid design. The main benefits of using these elevators include solid design & smooth, speed and flexibility, energy efficient and very safe.

**Figure 2.Pneumatic Elevator**

### Cable Driven or Traction Elevator

The traction elevator or cable driven elevators are the most popular elevators. It consists of steel cables as well as hoisting ropes that run above a pulley which is connected to the motor. This is geared otherwise gearless-traction type elevator. In this kind of elevator, several wire and hoisting cables are connected to the surface of an elevator car with covering around it on sheaves at one end & the other side is connected to a counterweight that travels up & down on its guide rails.

### Cable Driven Elevator

The counterweight is equivalent to the car's weight and half of the weight of the passenger in the car. This means, throughout the lifting process it needs extra power for

**Figure 3.Cable Driven Elevator**

the additional passengers in the car; the rest of the load is managed with the weight of the counter. When the control system is connected to the lift, then it drives the motors in a frontward way, and sheave turns around to move the car lift upwards and stops in the preferred floor where the car is controlled by the weight of the counter.

For the car downstairs movement, overturn occurs during a rotating motor through a control method. For conserving the energy, some types of lift use electric motors with four quadrant operation in the regenerative method. Because of the high rise as well as high-speed capacities, these are applicable in several escalators, lifts, etc.

### Capsule Lift

Capsule lift or Elevators are used in prestigious buildings, which can be called as decoration of a building because they improve the building's beauty as well as carries life into it.

**Figure 4.Capsule Lift**

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The main features of this elevators mainly include design, and travel comfort is best. The interior design of these lifts is attractive with a large glass panel for viewing. The ultramodern design of these lifts offers a cosmic zone travel experience for the passengers. These lifts are consistent and inexpensive with the least maintenance.

### Building Lift

A building lift is a vertical transportation among the floors of the building. These are frequently used in public buildings, complexes, offices, and multistory building. These lifts are important in providing vertical movement, mostly in high buildings, for a wheelchair as well as other non-ambulant building customers. Some type of lifts also is applicable for emigration & firefighting purposes.

**Figure 5.Building Lift**

### Passenger Lift

This type of lift has entirely included a lift car that moves vertically in a specially equipped lift shaft. Passengers are traveled between the floors in the building at quick speed. The control systems in the lift frequently designed to offer the most economical sharing of passengers all over the building. These lifts are very space efficient which are used in existing buildings where space is at a best.

**Figure 5.Passenger Lift**

The main advantages of using passenger lift give a very comfort traveling among different floors, particularly space efficient, fully fixed shaft, small construction works, and no level loadings on the building.

## Freight Elevator

In the world of elevators, these lifts are workhorses. These are very useful for transporting materials, goods in warehouses, manufacturing industries, shopping malls, seaports, etc. This type of elevator is separated into classes, to describe their load capacity as well as application. These lifts are strong in nature, and they are specially manufactured by engineers.

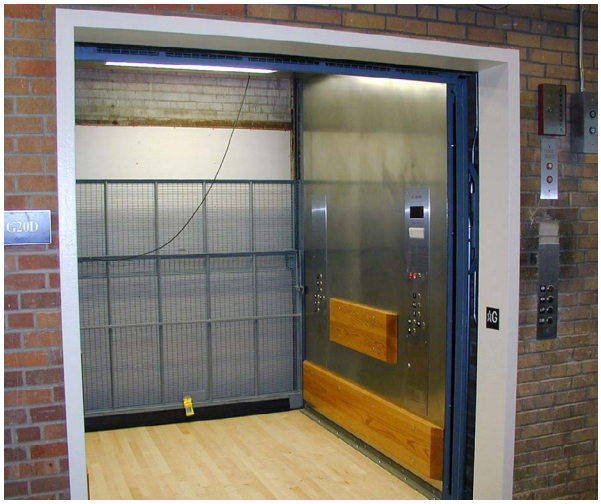

**Figure 6.Freight Elevator**

The features of this elevator include: the range of loading capacity is from 2500 lbs to 10000 lbs, height of the travel up to 50fts. The benefits of these elevators include; these elevators are designed for commercial as well as industrial applications. The flexible design to hold the application, door designs can be changed, eco-friendly, etc.

### Residential Elevators

Residential elevators provide stylish options to the platform as well as stair lifts. These lifts can be effortlessly incorporated in any available home, otherwise incorporated in edifice plans for latest homes. These types of elevators are available in different styles, and these can be installed in your home walls, otherwise included effortlessly to improve your home's decoration. The main benefits of residential elevators are; they can move you securely among floors even during a power failure. Quick installation and offers you an effortless life.

**Figure 7.Residential Elevators**

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Thus, this is all about an overview of elevators or types of lifts. These have been around for 100's of years; however, they work on a very fundamental principle. Even though the fundamentals of the elevator has not altered over the decades, but small twists have been made for the smooth ride as well as by using computer-controlled systems, efficiency has been improved for quicker transport.

## Literature Review

"Elevator Safety Monitoring System Based on Internet of Things", Zihan Ming" , Shaoyi Han, Zhanbin Zhang, Shuang Xia,iJOE – Vol. 14, No. 8, 2018: The continuous development of China's economic development and urbanization has led to the rapid increase in the number of building constructions and the dramatic upsurge in the number of elevators. Elevator has become an indispensable tool in people's life. As the special equipment, the elevator is divided into two parts, namely, the operator, and the gathered in all types of public fields, such as shopping malls, office buildings, sightseeing elevators and other public places. Most of operators are usually not trained on the safety feature and operation of elevators and do not have the necessary skills to address failures and accidents. Meanwhile, the common users are lacking in terms of knowledge and skills of elevator safety operation. Thus, in places where elevators are frequently used, the probability of elevator failure is high and the social effect is considerable. Among the main factors that cause the hidden dangers of elevator safety, the quality of the elevator itself is 16%, the improper installation factor is 24%, and the daily maintenance and use is up to 60%. Therefore, strengthening the daily supervision of elevators is particularly important.

"Tall Buildings and Elevators: A Review of Recent Technological Advances", Kheir Al-Kodmany, Buildings 2015, 5, 1070-1104; doi:10.3390/buildings5031070: When people think about the development of cities, rarely do they contemplate the critical role of vertical transportation. Consider, however, that each day, more than 7 billion elevator journeys are taken in tall buildings all over the world. Efficient vertical transportation has the ability to limit or expand our ability to build taller and taller skyscrapers, and recent innovations in elevator design promise to significantly reduce energy consumption. Antony Wood, 2014, a Professor of Architecture at the Illinois Institute of Technology (IIT) and the Executive Director of the Council On Tall Buildings and Urban Habitats (CTBUH), explains that advances in elevators over past 20 years are probably the greatest advances we have seen in tall buildings. Indeed, the race to build ever taller skyscrapers has sparked fierce competition among lift manufacturers to build faster, more efficient, safer, more comfortable and more economical elevators. For example, elevators in the Kingdom Tower in Jeddah, Saudi Arabia, under construction, will reach a height record of 660 m (2165 feet); and elevators in CTF Finance Centre in Guangzhou, China, under construction will travel with a speed record of 20 m/s (66 feet per second).

"A research paper on control of an elevator in case of failure of rope holding the inside cage", Rushikesh Rajendra Khadilkar, Jayesh Totaram Bharambe, www.IJARIIT.com (Volume 5, Issue 2): In the current scenario, the elevator is of great importance in day-to-day life. The increasing modernisation has led to the development of multi-storey buildings. So, elevators are the only source to reach various floors within less time. Therefore, this increasing use gives rise to the safety of people travelling in the elevators. Elevator accidents kill about 30 and injure about 17,000 people each year globally, according to data provided by the 'U.S. Bureau of Labour Statistics and the Consumer Product Safety Commission'. Due to this, it is necessary to develop a system which would make travelling in elevators safe even in critical conditions like fire, rope wreckage, free fall etc. In our project, we are developing a mechanism which would stop or reduce the free fall velocity of the elevator cage. Sensors are used to sense the speed increase and send a signal to the controller to actuate brakes and reduce the speed of the free fall of the elevator.

"An assessment of maintainability of elevator system to improve facilities management knowledge-base", N.A. Siti, A.S. Asmone, and M.Y.L. Chew, ICRMBEE IOP Conf. Series: Earth and Environmental Science 1234567890117 (2018) 012025: Building maintainability has significantly affect building's cost, risk, and performance. A review of building performance of construction industry was undertaken and it expressed building maintainability is substantially affecting building performance. Mechanical and Electrical (M&E) services which include elevator system is one of the elements which contribute to a major percentage of the total construction cost of a building from initial to its operation and maintenance costs. If M&E services are facing with malfunction or breakdown, it will contribute to the entire building performance substantially influence the building's life cycle cost. This system must operate in an efficient and effective manner as its operation not only affected the system's life cycle cost but also ensure safety consideration to the users. Inappropriate maintenance of elevator system can cause rusted and cracked steel wire rope and it is one of the examples of defective in an elevator system, which can trigger accidents to happen. The most common practice of elevator inspection is depending on human visual inspection, and such practice fails to detect the faults occurred in the system. Over the past few years, there have been some reported cases of injuries caused by elevator defects or malfunction. Hence, it is very important for the building owners, particularly for the facility management team to perceive it as a dominant part of building maintenance element, while not merely putting

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all the duty of care to the mechanical and electrical team. Meanwhile, one of the strategies to minimize the failures is by recognizing the defects and its causes. By doing so, a proper maintenance of building systems can be achieved which may delay the process of degradation of the systems.

This study aimed to investigate the maintainability issue of elevator system by recognizing the type of operational defects or malfunction that could be found in the elevator system and the possible causes of each defect detected. By understanding the common defects found and the possible causes, it helps the maintenance management team to make a prediction of possible more damages resulted from independent defects of each elevator's components. In addition, the maintenance-management issues were discussed to identify the prime challenges of maintaining elevator system. Finally, a recommendation framework was then tabulated with the objective to improve the knowledge base of which includes the testing and diagnostic, good practices and solutions to rectify the elevator defects.

"A Survey Paper on Design & Control of an Elevator for Smart City Application", Prof. Omkar M. Shete, Divyani V. Shete, Surabhi G. Pise, DOI:10.15662/IJAREEIE.2017.0604039: Due to the cause of rapid population growth at the cities and multi-stored buildings, the need of elevators is being increased. With the rising life standards and attention to human and with tremendous development in structural and architectural engineering for multi storage building, 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. Hence more importance is given to the design of an elevator control system which is easy for the maintenance and to perform an efficient function. In our project we use PLC in the designing of the elevator control system. PLC has many advantages over other control systems. It is known for its flexibility, operational speed, reliability, ease of programming, security, and it is easy in implementing changes and correcting errors. A PLC is an example of a real time system since output results must be produced in response to input condition within a given period of time, Programmable logic controller (PLC) is a digital computer used for automation of processes. It controls all the functions of the elevator such as door opening and closing at different floors etc., Because of the use of PLC, elevator systems are getting better, faster, stronger and better quality elevators are produced.

"*The Use of Rope-Free Multidirectional Elevators in Skyscrapers*", Rachel Dancer, Julia Jones: The traditional elevator creates a variety of inefficiencies for building users, building owners, and building designers. These unsustainable inefficiencies are both time wasting and cost prohibitive, leading to buildings that inconvenience users and limit the designers and building owners. In a study conducted by IBM in 2010, the "cumulative time that office workers spend waiting for elevators in the past 12 months totalled 92 years" across sixteen metropolitan areas in the United States. Elevator inefficiencies reach far beyond those who ride them on a daily basis. As buildings grow higher, elevators must service a greater number floors and people. In most skyscrapers, this means that a large number of elevator shafts and cars are required in the building. However, the installation of elevator banks has prominent impacts on the profitability and usability of a skyscraper. Archer asserts that "each additional bank of elevators reduces the floor area available for rent or sale-thus pushing down the revenue potential for the building". As the number of elevators in a building increases, the square footage of each floor consumed by elevator shafts rapidly increases, while space available for rent begins to dwindle. Ken Yang, a renowned architect and ecologist, provides guidelines for acceptable space use in skyscrapers. He asserts that "net-to-gross floor area should not be less than 75%, while 80% to 85% is considered appropriate". Net-gross-floor area (also known as space efficiency) is "simply defined as the ratio of NFA to GFA". NFA, formally known as the net floor area, is the "actual occupied area not including unoccupied accessory areas such as corridors, stairways, toilet rooms, mechanical rooms and closets.

## Conclusion

The model of a voice-controlled lift is universal and it enables to realize regimes of real working lift by using up-to-date means.

A voice recognition program and its connection with the controller can supply a sufficient amount of commands necessary for the lift control.

The model of a lift is a useful tool for training students in specialization of automation, voice signal recognition and control technologies as well as for specialists' qualification improvement in similar specialization.

Voice controlled systems are especially useful for disabled people. Speaker dependent projection based recognition algorithm ensures a sufficiently good recognition accuracy of voice commands. It can be improved by increasing the

amount of references and by selecting acoustically different voice commands.

References can be collected from many speakers and averaged. The presented recognition algorithm in such way can be transformed into the "multi-speaker independent" one.

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