

# Modelling & Testing Of Automatic Push And Sliding Door Using Sensors And Automation System

D.J.Waghmode<sup>1</sup>, A.R.Vasatkar<sup>2</sup>

<sup>1</sup>Dept of Civil Engineering

<sup>2</sup>Asst. Prof., Dept of Civil Engineering

<sup>1,2</sup>TSSM's BSCOER Narhe, Pune-411041, India

**Abstract-** *In this research work, an Automatic push and sliding door System using a sensor was developed. It uses a sensor, pneumatic or hydraulic automation, a control unit & drive unit to open and close doors at the entrance of a building or room. The primary aim of this research work is to create best aesthetic view Interior design with space saving and to learn in details about how the automatic push and sliding door system works and to understand the concepts involved. The secondary aim is to fabricate a simple door model to show how the door system works. The main activities involved in this work are the research done on how the automatic push and sliding door works, sketching a detailed circuit & then fabricating a simple model.*

*Developer, Architects & Engineers are therefore very much conscious about construction activity of automation regarding its quality, Cost & progress. Automation of building is very important part of high-rise buildings. As it is automatic function therefore lighting and electrical activity is most important part of structure.*

*There are several methods of doing sliding door like automation used in high-rise buildings because it's good quality, simple application process & faster progress and testing of model.*

**Keywords-** Door, Sensor, Automatic, Construction, push, Sliding and Design.

## I. INTRODUCTION

Now a day India going to towards the digitalization. India's prime minister says make India is digital. And India is very fast developing country. Now Indian construction felid going to construct intelligent building. Intelligent building means *An Intelligent Building provides a productive and cost effective environment. It integrates its various facilities and systems to effectively manage resources in a coordinated mode to maximize –*

- Occupant protection
- Energy and operative cost savings

- Flexibility in adapting to changes

It is one that provides a comfortable, productive and cost effective environment through a Comfortable, productive and cost effective environment through optimization based on Three elements: people (owner, builder and occupants), products (materials, structure, Facilities, services etc.) And processes (automation, control systems maintenance, performance etc. and interrelations between them...

In construction felid going to atomization. In residential and commercial building use various digital and automatic equipment and parts. Just like is automatic sliding door, automatic opening door, automatic lights on/ off, automatic pump on / off depends upon water level, lights on off by using motion sensor, open door by using video door phone, open the main gate by senescing vehicle pass, entrance lobby door open and close by using biometric and numeric system, gas lick detector, panic switch, atomized mechanical parking, Thief protecting system, autodialed system, automatic drip irrigation system.

In this thesis of automatic push and sliding door concept is very complicate. It is related to civil engineering, computer engineering, mechanical engineering, interior designing, architecture engineering, and environmental engineering.

In this project this type of door is very used for interior designing concept and sound insulation and air flow in the room. This type of the door is very good for space saving concept.

In this type of door are made by using pneumatic pressure control by using infrared sensor and controllers.

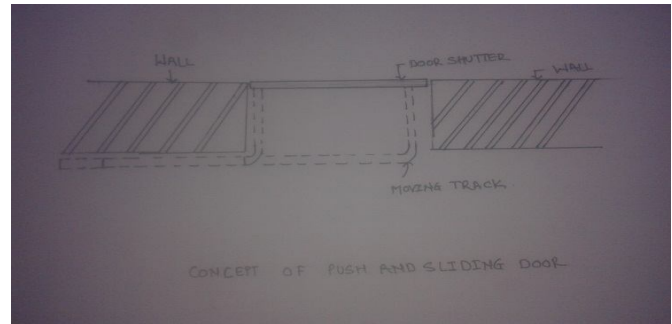
Push Sliding door is a type of door which opens horizontally by sliding but turns door shutter at 90 degree, whereby the door is either mounted on or suspended from a track. Types of sliding doors include pocket doors, Arcadia doors, and bypass doors. Sliding doors are commonly shower doors, glass doors, screen doors, wardrobe and the system can

also be done and implemented in the building of school, hall, auditorium, banks, shopping malls, various departmental buildings and they can be extremely useful in a wide variety of environments.

An automatic push and sliding door is an automated movable barrier installed at the entrance of a room, building or space to control and restrict access or provide privacy. Also an automatic door indicates a door that opens on its own as a moving object approaches it. It is an electro-mechanical door that has undergone the process of automation. The reason for making the push and sliding door automatic is to allow pedestrians to gain easy entrance in and out without having anyone to keep opening and closing the push and sliding door. Push Sliding door is a type of door which opens horizontally by sliding but turns door shutter at 90 degree, whereby the door is either mounted on or suspended from a track. Types of sliding doors include pocket doors, Arcadia doors, and bypass doors. Sliding doors are commonly shower doors, glass doors, screen doors, wardrobe and the system can also be done and implemented in the building of school, hall, auditorium, banks, shopping malls, various departmental buildings and they can be extremely useful in a wide variety of environments. Automation is the art of making processes or machines self-acting or self-moving, it also pertains to the technique of making a device, machine, process or procedure more fully automatic. An automatic push and sliding door is an automated movable barrier installed at the entrance of a room, building or space to control and restrict access or provide privacy. Also an automatic door indicates a door that opens on its own as a moving object approaches it. Condition at KUNDAN PRESIDIA SITE at NIBM Road, Kondhawa Khurd, Pune, Maharashtra, India.



GROUND AND 1<sup>ST</sup> FLOOR PLAN OF CLUB HOUSE.



SECTION DETAILS "A"

In section "A" gives the details of door slide on the track. Track is fixed on the top of the door. With the help of "U" type sliding channel. The case study of on-going projects & data collected on site. It is identified that automatic push and sliding door required for fixing automatic push and sliding door is difficult, time consuming & costly activity.

## II. REVIEW OF AUTOMATIC SLIDING DOORS PAPERS

- Intelligent Automatic Door System- Saurabh S. Badave<sup>1</sup>, Makrand N. Kakatkar<sup>2</sup>

In this literature I studying the conventional automatic door systems installed at users space the settings of the door such as opening speed, closing speed, dwell time, are fixed. If the door settings need to be changed, the end user has to call a technician to fix it.

The designed door system is made safer than conventional implementations by using multiple sensors together to detect human's presence. If a person stands within the door frame, the door will not collide on him when it starts closing

When conventional automatic door systems are installed at user's space, the settings of the door such as opening speed, closing speed, dwell time, are fixed. If the door settings need to be changed, the end user has to call a technician to fix it. The end user has to depend on the technician's immediate availability, and also has to bear the costs of the technician's visit. A new approach is proposed in this project so that the end user is made able to do the changes by himself by means of a handheld device. The handheld device has a simple interface for the end user to understand.

- Design and construction of an automatic sliding door using infrared sensor-Oladunmoye M.<sup>1</sup>&Oluwatomi A.<sup>2</sup>

In this research work, an Automatic sliding door System using an infrared sensor was developed. It uses a

sensor, a control unit & drive unit to open and close doors at the entrance of a public building. The primary aim of this research work is to learn in details about how the automatic door system works and to understand the concepts involved. The secondary aim is to fabricate a simple circuit model to show how the system works. The main activities involved in this work are the research done on how the automatic door works, sketching a detailed circuit & then fabricating a simple model. Sliding door is a type of door which opens horizontally by sliding, whereby the door is either mounted on or suspended from a track. Types of sliding doors include pocket doors, Arcadia doors, and bypass doors. Sliding doors are commonly shower doors, glass doors, screen doors, wardrobe and the system can also be done and implemented. Automation is the art of making processes or machines self-acting or self-moving, it also pertains to the technique of making a device, machine, process or procedure more fully automatic, it is a self-controlling or self-moving processes.

- Multiple mode control of a compact wrist with application to door opening- Hongwei Zhang<sup>1</sup>, Yugang Liu<sup>2</sup> Guangjun Liu<sup>3</sup>

This paper presents the multiple mode control system of a compact wrist, which can work in active mode with position or torque control, or passive mode with wrist-environment interactive force compensation. Passive mode is realized without using mechanical solutions such as a clutch, which not only saves weight and volume of the wrist, but also avoids losing track of the joints' position while switching from passive mode to active mode. The objective is to make the wrist suitable for dexterous manipulation in unstructured environments, such as door opening. A robust adaptive controller is developed for tracking control of the wrist in active mode; and a new interactive force compensation technique is proposed based on force sensor measurement, to enable passive working mode of the compact wrist.

- Reliable non-prehensile door opening through the combination of vision, tactile and force feedback by Mario Prats · Pedro J. Sanz<sup>1</sup> · Angel P. del Pobil<sup>2</sup>

A vision-tactile-force integration approach has been proposed and validated in a real manipulation environment. A door opening task is executed through the combination of the control signals provided by a position controller, which has an initial coarse estimation of the object pose, a vision controller based on an articular object pose estimator, a tactile controller, which looks for not losing the contact during manipulation, and a stiffness force controller, in charge of pushing along the task direction at the same time that the force is regulated on the rest of directions. Different sensor combinations, such as

force-alone, vision-force or tactile force, are also possible in case that one or more sensors become unavailable. In order to study the advantages of adding tactile feedback to vision and force-based manipulation, several experiments have been carried out with the task of opening a sliding door under manually introduced errors.

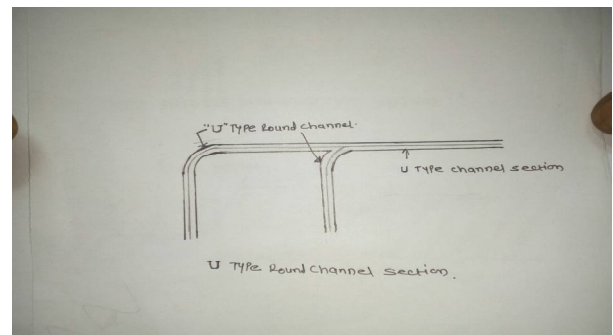
### III. MATERIALS, MACHINERIES AND DESIGN OF AUTOMATIC PUSH AND SLING DOOR

#### Materials

- Sliding door,
- Sliding track,
- Sliding door wheel,
- Hydraulic auto closer,
- Pneumatic auto closer,
- Door shutter,
- Door stopper,
- Infrared sensor,
- Numerical keypad,
- Door look,
- U type sliding channel,
- U type round sliding channel,



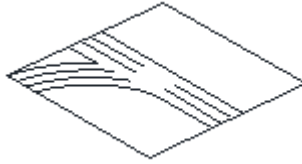
Sliding door wheel



“F” shaped “U” type round channel section



Round shape track



"Y" shape track

### Machineries

- Wood drill machine,
- Concrete Dill machines,
- Plywood cutting Machine,
- Plywood drilling Machine,
- Sliding machine,
- Hydraulic automatic panel,
- Pneumatic automatic panel,
- Rolling wheels,
- Adriano microcontroller,
- Infrared sensor.

### Methodology

- Collecting the details of doors, windows, gates.
- To collect the sliding door material To Be Used As fitting of push and sliding door.
- To make special "F" shaped U channel.
- To Have Better Understanding Of automation Procedures.
- To achieve energy efficient automatic door having good aesthetic view and saving a space.
- To introduce a model of push and slide door.
- To study of pneumatic automatic push and sliding door.

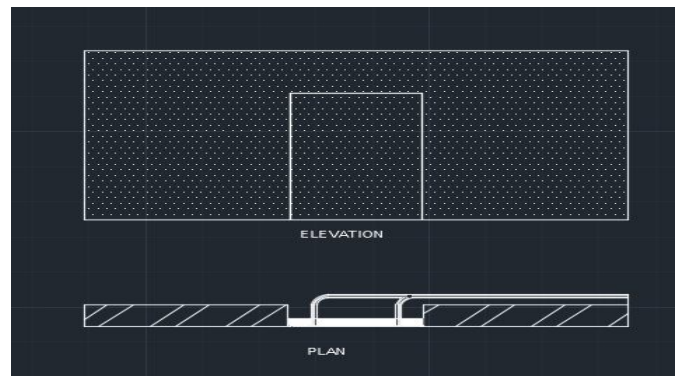
To Complete the Project with Multiple Objectives Of from infrared sensors is the input of the microcontroller. This signal goes to the microcontroller which has a specific program written for it. The pneumatic actuator works according to the set of codes in microcontroller. The cylinders retract when the obstruction is detected by the infrared sensors thus opening the door and expands when the obstacle has been detected by the second infrared sensor located on the other side. This pneumatic operation is controlled by suitable electro-pneumatic circuit. The 2nd infrared sensor is installed

at the other end of the door. It senses whether the object which came in through the door has passed out of it successfully .This signal is sent to the microcontroller and it has set of codes to control this operation.

### III. MAKING OF THE PUSH AND SLIDE DOOR

**M. S. FRAME:** - The M.S. frames are made up 25 x 25MM SQ. tube which are initially cut into approximate length and planned to get a smooth and parallel surface. The M.S. pipe pieces are joined in such a way that it forms a rectangular shape in order to accommodate two side wall and in between two wall door are done with 40 mm x 40 mm pipe. Hanging sliding door are done by using "F" shaped U channel. Plywood fixing on M.S. frame. After fixing of plywood it decorative with the help of finishing material.

**PUSH AND SLIDING DOOR AND "F" SHAPED U SLIDING CHANNEL:** - The doors are made in such a dimension that it suits the M.S. Frame slot. The door is made of 40 MM X 40MM sq. tube and plywood according to the required dimension. "F" shaped U sliding channels (F-channels) are fixed in the inner side of the rectangular frame using nails so that the plywood sheets can easily slide on them.



AUTO CAD 2-D model of the Door

**MOUNTING OF THE CYLINDER:-**The door consists of a fixed part and a movable part. The pneumatic cylinder is mounted on the fixed part using bolts and nuts. The piston is clamped to the movable part using a 2 inch L clamp and using suitable dimension of nuts and bolts. By clamping this movable part of the door moves according to the movement of the piston i.e. the door closes when the piston expands and the door opens when the piston retracts.

**MOUNTING OF INFRARED SENSORS:** - There are two infrared sensors mounted on the both sides of the door. The sensor consists of an emitter and receptor unit. When the signal from the emitter is received by the receptor it signifies

the presence of an obstacle. The signal from IR sensors is the input of the microcontroller. This signal goes to the microcontroller which has a specific program written for it.

### Advantages

- Best aesthetic view Interior design with space saving.
- Very good energy efficient door, more security and safety.
- Synthesis of new type of door / model in construction industry.
- Smooth Operation of the push and slide door using automation system.

### Disadvantages

- It is very costly.
- Automation systems required electricity.
- It required skilled carpenter in more strength.
- Material like shutters, sliding wheel, Sliding door, Sliding track, Pneumatic auto closer, Door shutter, Infrared sensor, Numerical keypad needed.
- Construction Cost per sq. meter is much more expensive than suggested automatic push and sliding door.

## IV. APPLICATION

In construction site of Kundan spaces, site name is KUNDAN PRESIDIA. In club house near reception area and pantry area as show on fig. 1 ground and 1<sup>ST</sup> floor plan of club house. And its details given in fig no. 2 section details “A”. As per suggestions given to construction company “KUNDAN SPACES LLP.” For developing automatic push and sliding door instead of normal open able door at minimum space at club house. They implemented the given suggestion for balance work of project after studying In-depth remedial recommendation given by cross checking data collection & its result regarding subjected matters. Automatic push and sliding door is next option to normal open able door, Result shows that automatic push and sliding door gives better results than automatic sliding door without affecting its purpose & gives more progress in less time, also is more economical and environmental then normal door or opening. Therefore project team has approved the automatic push and sliding door instead of normal opening in this project.

## V. TESTING

Automatic push and sliding door by using pneumatic system. The physical realization of the system is very

important. This is where the imaginary idea of the whole idea meets reality. After carrying out all the paper design and analysis, the project was implemented and tested to ensure its working ability, and was finally constructed to meet desired specifications. The process of testing and implementation involved the use of some equipment's. The digital multi-meter basically measure voltages, resistance, continuity, current and transistor. The digital multi-meter was used to check the various voltage drops at all stages in the system, and most importantly the infra-red receiver stage, to help check the references in the comparator circuit.. The project was tested using AC (alternating current) power supply; the voltage regulator is used to regulate this voltage to the 5 volts needed by the circuit to operate. At a close distance, when the infrared senses traffic approaching the signal been sent to the receiver is broken thereby causing the automate slide door to picks the signal and therefore open for 20 seconds and thereafter closes after 20 seconds.

## VI. CONCLUSION

The objective of this project was to design and fabricate a model of an automatic pneumatic push and sliding door using infrared sensors. Pneumatic systems provide motive power in a cheaper, safer, more flexible, and more reliable way than the electrical actuators and actuators.

The door will open whenever the infrared sensor 1 mounted on the entry side of the door senses the object and it will close only if that object has passed through the door and the infrared sensor 2 mounted on the exit side of the door senses it..

As the whole world is switching towards automation , the automatic pneumatic push and sliding door has a important role to play in future industries, malls and buses, airports, educational institutions, hospitals and also in domestic usage. It can be used to increase the security of important places. The pneumatic part will ensure that the door is cheaper and has smooth operation compared to other automatic doors.

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