Voice Command Based Opening and Closing of Refrigerator Door

Anurag Bhardwaj  
UG Student  
Department of Mechanical Engineering  
Government College of Engineering and Technology Jammu

Sanjeev Gupta  
Assistant Professor  
Department of Mechanical Engineering  
Government College of Engineering and Technology Jammu

Deeshant Jasrotia  
UG Student  
Department of Mechanical Engineering  
Government College of Engineering and Technology Jammu

Vageesh Baigra  
UG Student  
Department of Mechanical Engineering  
Government College of Engineering and Technology Jammu

Mohit Sharma  
UG Student  
Department of Mechanical Engineering  
Government College of Engineering and Technology Jammu

Abstract

With new technologies surfacing day-by-day, we can use them to make new products and even can modify the existing ones. In a practical implementation, it is possible to use electric motors to open and close a refrigerator door. This can be done by reversing the direction of motion of motor when required. Reversing the polarity of the starter winding will solve the purpose. There are many ways to operate a motor and control of motor from human voice is one of them. In this application, a microcontroller-based voice input electronic circuit is designed, which can be used to rotate the motor in the required direction and hence to open and close the refrigerator door. The motor is connected to the axis of the refrigerator door. The relays are connected to the electric circuits for straight and reversed polarity. The motor operates in a direction as commanded. Microswitch are used to send signal to the microcontroller, which further stops the power supply to the relay and ultimately stops the motor rotation.

Keywords- Voice Command Control, Microcontroller Circuit, Automated Control, Hands Free Operation, Reliable Modification

I. INTRODUCTION

Refrigerator is a most commonly used household and commercial equipment which helps us to store variety of products like food, chemicals, etc. While operating the refrigerator door, it sometimes becomes very difficult for the operator to open and close the door when his/her hands are totally occupied. And this becomes even more difficult when we use a deep freezer. In order to overcome this problem, we can utilise the modern technology to comfort the operator with the ease of opening and closing the refrigerator door by using a voice command. In this case the door can be automated by utilizing very commonly available electric and electronic parts available in the market. The modification can be done to new refrigerators being manufactured and the existing ones also. The cost involved in automation is very nominal but requires technical skills to execute the project.

II. CONSTRUCTION

The modification can be done with very easily available materials. The material required for the modification are as follows:
1) Microcontroller Board  
2) Voice Recognition Module with Microphone  
3) USB to TTL module  
4) Relay  
5) Microswitch  
6) Motor  
7) Software  
8) Power source  
9) Jump wires  

The microcontroller board executes the command which is fed to the voice recognition module through microphone. The voice recognition module works as a human-machine interaction medium. With the use of a microphone it extracts and analyses the
features of a human voice. The USB to TTL module works as a medium to communicate between human voice and electronic machine. A relay is an electrically operated switch which is used to open and close a circuit. There are two circuits for the rotation and reverse rotation of the motor. One relay connects directly to the motor circuit and the other connects to the opposite polarity circuit. The opposite polarity circuit basically changes the direction of the rotating magnetic field produced by the main and starter windings. A microswitch is an electronic device which is used to send signal to the microcontroller. It is used as a limit switch which is generally placed to work as a position detector. An electric motor is a prime mover which delivers rotational motion. The electric motor is coupled to the door axis which helps it to open and close. Software is required to generate the commands which will help the microcontroller to execute its operations. Power source is required to supply energy to the whole system for the operation. As the operation is based on DC power supply hence we can use a battery or an AC to DC converter. Jump wires are required to connect the elements together to have a flow of energy between them to execute the operation.

### III. Working

It starts with the voice command from the human. As soon as the voice recognition module detects the sound through the microphone it converts it to a digital signal and passes through a TTL circuit which detects the intensity and waveform of the signal. The sound features are then sent to the microcontroller. As the microcontroller receives the signal of a specific waveform and intensity it matches it with the coded programme. After analysing the code, the microprocessor sends power supply to the specific relay. When the relay receives the power supply, it gets energised and completes the circuit. As soon as the circuit gets completed the power supply to the motor starts. When the motor rotates, the refrigerator door also starts rotating as both are coupled mechanically. When the door reached its open or closed position the stops provided at the door presses the microswitch. This microswitch sends signal to the microcontroller.

As soon as the microcontroller receives the signal from the microswitch, it stops the power supply to the relay and the relay gets de-energised. The motor circuit hence become open and power supply to the motor also stops. In this way the door gets open or closed. The coding can be done on different available softwares and the codes are then uploaded to the microcontroller board through the USB port.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of material</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Microcontroller Board</td>
<td>1</td>
</tr>
<tr>
<td>02</td>
<td>Voice Recognition Module with Microphone</td>
<td>1</td>
</tr>
<tr>
<td>03</td>
<td>USB to TTL module</td>
<td>1</td>
</tr>
<tr>
<td>04</td>
<td>Relay</td>
<td>2</td>
</tr>
</tbody>
</table>
The technology is evolving day by day. The modernisation in technology is helping the humans to explore more possibilities to make the human life comfortable. In this case the refrigerator door can be opened and closed by using hand gestures and we can also use a proximity sensor to operate the door. These implementations can also help differently abled people to operate the door at their will according to their comfortability. In addition to this if we use rechargeable batteries to operate the circuit and the motor, we can also eliminate the constrain of using power supply from AC source. Moreover, modifications can be done to utilise the power output from alternative sources like invertor, solar light, etc.

V. CONCLUSION

When the technology evolves with time, its implementation to different equipments should be made at a very convenient cost for the user. By implementing a voice command circuit to a refrigerator door, we can eliminate the effort of the user to open and close the door at a very nominal extra cost. The implementation is such that it eliminates the requirement of an extra helping hand for placing or extracting material from the refrigerator. As the power requirement is very nominal hence it does not add to the annual energy consumption cost of the refrigerator. Moreover, the whole setup occupies a very nominal space and hence the requirement of extra space is eliminated. The equipments used to automate the refrigerator door are reliable and efficient and available in the market at a reasonable cost.

REFERENCES