



Feeding Mechanism for Handicapped Person

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ABSTRACT

There are more than thousand peoples disabled. For eating purpose they need to rely on someone else. For their independent living there are many mechanism developed but cost of such mechanism is high. We have developed a feeding mechanism for handicapped person for their independent living and cost reduction as a objective. This mechanism consists of simple Rack and pinion arrangement with DC servomotors directly interfaced with arduino. In this mechanism how feeding mechanism actually works is given.

Keywords: Handicapped, Arduino, Mechanism

I. INTRODUCTION

The growing number of elderly or disabled peoples in institutional living increases the necessity of designing new assistive devices. The desire to feed elderly and those with upper limb disabilities has captured the minds of many researchers and designers for decades. There are numbers of mechanism present around the globe. We also developed one mechanism by means of simplicity. So we have used rack and pinion mechanism for vertical and horizontal movement and pinion is rotated by DC servo motor which is interfaced with Arduino. We have developed this mechanism for cost reduction and user friendly as an objective.

II. ARCHETECTURE OF FEEDING MECHANISM

This mechanism consists of Rack and pinion arrangement for vertical and horizontal motion. DC servo motor is used to rotate pinion so as to obtain linear motion of the rack. Connections of DC servomotor are directly interfaced with arduino for

automating operation. Spoon is connected to upper rack for lifting of food purpose.

A. Basic components of Mechanism

- 1) Food tray
- 2) Base frame
- 3) Rack and pinion
- 4) Servomotors
- 5) Spoon
- 6) IR sensor

B. Food tray:

Food tray is used to store a food. As per type of food tray is classified. So for solid type of food, Flat food plate is used while for Liquid type of food, parabolic bowl is used. For foods that should be picked up by a fork, a flat plate is better. Some assumptions for operation are:

- 1) Large solid foods are cut into bite-size pieces.
- 2) The fluid and semi-fluid foods are poured into the deep sloped plates and the solid foods are placed on the flat plates.
- 3) The user has control of the neck and head.
- 4) The user is in an upright position or sitting at an angle that is safe for eating, and
- 5) The spoon and fork are only used with the deep sloped and flat plates, respectively.

C. Base frame:

The frame is made of cast iron .dimensions is 210*265 mm and Height of frame is 75mm and thickness is 18*18mm.frame is base of setup on which all parts of project are mounted.

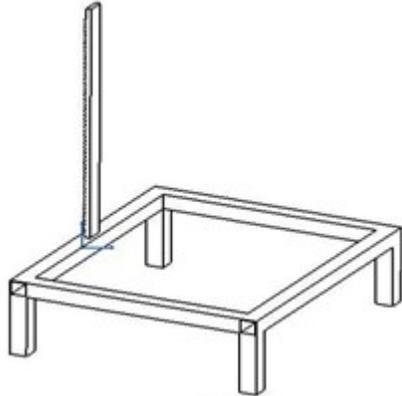


Fig. Layout of Frame

D. Rack and pinion:

Two Rack and pinions are used in project. One rack is 290mm in length, another is 200mm in length, and pinion is 10mm in diameter. Pinion has 15 teeth. One is used for horizontal motion while other is used for vertical motion.



Fig. Rack and pinion arrangement

E. Servomotors:

The servo motor is most commonly used for high technology devices in the industrial application like automation technology. It is a self contained electrical device that rotates parts of a machine with high efficiency and great precision. There are three DC servomotors used for rotation of two pinion through 360° and one spoon through 45°-60°.



Fig. DC servo motor

F. Spoon:

Spoon used in this mechanism also classified as per type of food. For solid type of food flat spoon is selected and for liquid type of food deep food is selected. The spoon is attached to shaft and shaft is attached to servo motor. Spoon size is 10cm long.



Fig. Spoon

G. IR Sensor:

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These type of sensor measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. The range of IR sensor used is 10cm.

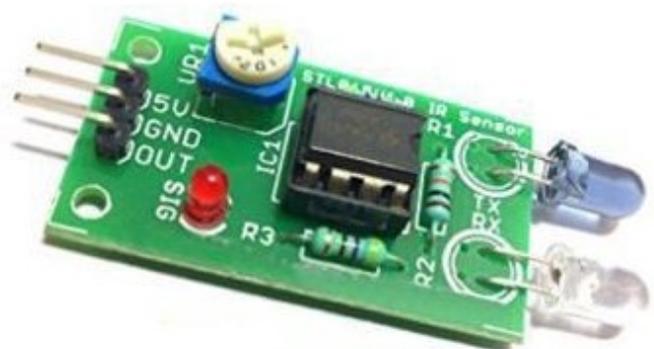


Fig: IR Sensor

III. WORKING OF FEEDING MECHANISM

The feeding mechanism for handicapped person consists of rack and pinion arrangements .which has two sets of rack and pinion. One rack has 290mm in length and another is 200mm in length. the pinion has 10mm in diameter. The frame is made of cast iron. Dimensions is 210*265 mm and Height of frame is 75mm and thickness is 18*18mm.frame is base of setup on which all parts of project are mounted. Spoon is attached to rotating shaft, which is rotating in 360°. Three servo motors are used in this mechanism.

The vertical motion of rack and pinion is to rotate in vertical direction with the another rack and pinion is rotated horizontally which complete the particular distance and rotating shaft is attached to horizontal rack and pinion and spoon is attached to this shaft rotating in 360°.

DC servomotors are used to rotate pinion through 360° due to which rack travels in vertical and horizontal direction. One DC motor is also connected to spoon for rotation through 45 - 60.

All servomotors are interfaced with microcontroller so that proper movement of all mechanism can be possible. The sequence of operation is such that first of all there is movement of spoon by taking food from plate. Then after that rack is moved upward to achieve required distance after that second rack is moved horizontally towards mouth and due to IR sensor located on the spoon it locates mouth position. Spoon is stop at certain distance from mouth.

Program for this working is written as per sequence of operation decided.

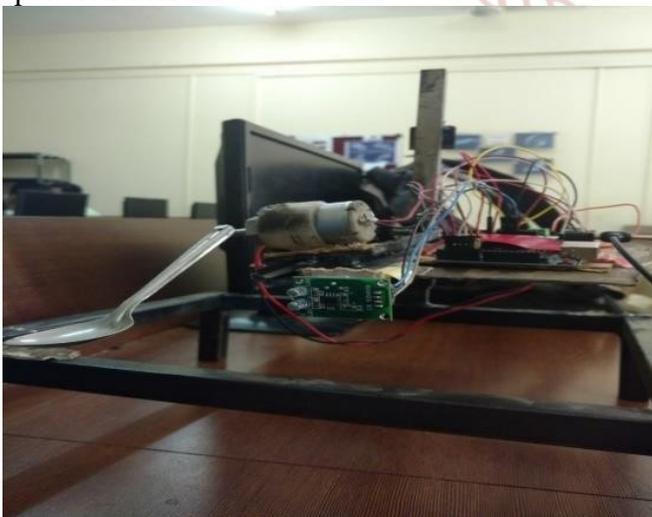


Fig: Feeding Mechanism

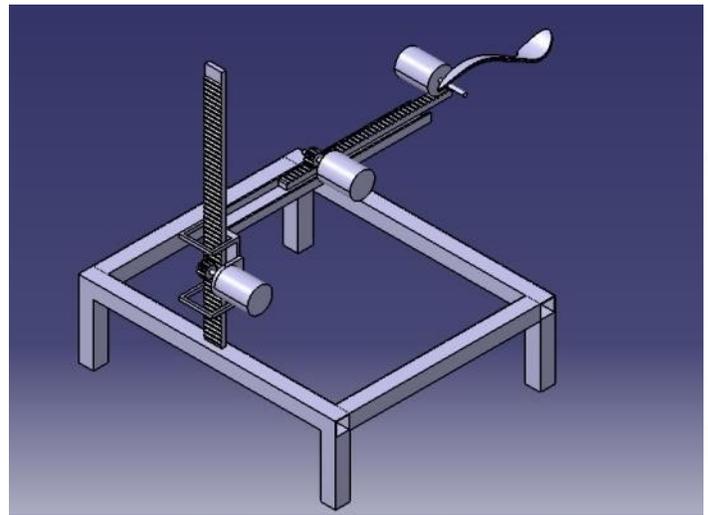


Fig: 3D CAD model

IV. ADVANTAGES

1. Light weight
2. User friendly and easy operation
3. Can be used for any person
4. Time effective.
5. Compact and easily transferrable.

V. DISADVANTAGES

1. High maintenance cost
2. Less accuracy

VI. CONCLUSION

As per our developed mechanism, we have concluded that Rack and pinion mechanism is simplest among all the mechanisms. Due to usage of Arduino, automatic operation is possible. As per developed mechanism, our cost is reduced and is also user friendly. Mechanism is also used to Achieve independent living for handicapped person

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