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Development of Page Changer Mechanism for Handicap

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***Abstract**: There are millions of people with disabilities in term of poor hand working. They are not able to perform the activities, which are important for the daily living like reading books, newspaper or magazine. This project details the design and builds process of an automatic page changer. The primary goal of this project is to design and manufacture a product that not only has an efficient operation, but is easy to use for people with disabilities and minimal assistance. The device will consist of a mechanical structure to support the book, an electrical system to facilitate the turning of pages in both directions. A low-cost page changer device has been designed, allowing a user to change the page by simply touching a switch with their legs or other body part.*

Keywords: Button operated, Handicap, Reading, Book

I. INTRODUCTION

Page changing is an important process, while reading a book. It is a universal task that many people take for granted [1]. Individuals with diagnoses such as arthritis, multiple sclerosis, cerebral palsy, stroke, and acquired brain injury often experience difficulties with fine motor tasks due to poor hand functioning, which may be a result of spasticity, contractures, joint subluxation, or structural deformities in the hand [3]. Reading is an example of a meaningful activity that may be difficult for these people due to the requirement of fine motor skill to turn a page.

The main goal of this paper is to review the state-of-the-art in button operated page changer, the assistive technology for this mechanical process [2]. A button operated page changer is a device that consists the mechanical elements for turn a book page-free in either direction. A suitable controlled switch can be used to activate the page turning mechanism. Hands- free operation is particularly important to musicians and disabled individuals.

Musicians, for example, are often hampered by the need to turn pages in a music score while their hands are occupied playing their instrument. In this manner, the page changer is directed toward the substitution of normal reading functions for people with disabilities. Its role as beneficial technology in hospitals, homes, and libraries [1]. Developing a button operated page changer will ultimately provide a capability to turn and hold the page using a mechanical structure for people who need to read without assistance.

A. Methodology

1) Concept of development
2) Model design
3) Components selection
4) Purchasing components
5) Development of product
6) Testing the working model

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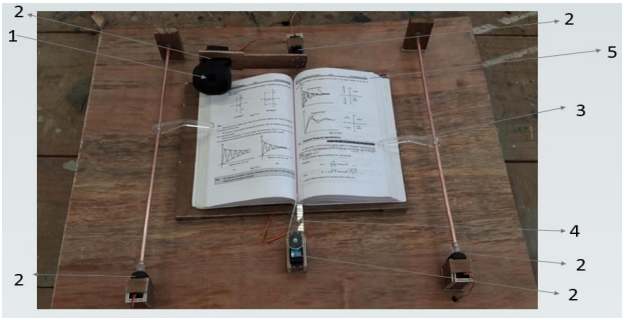
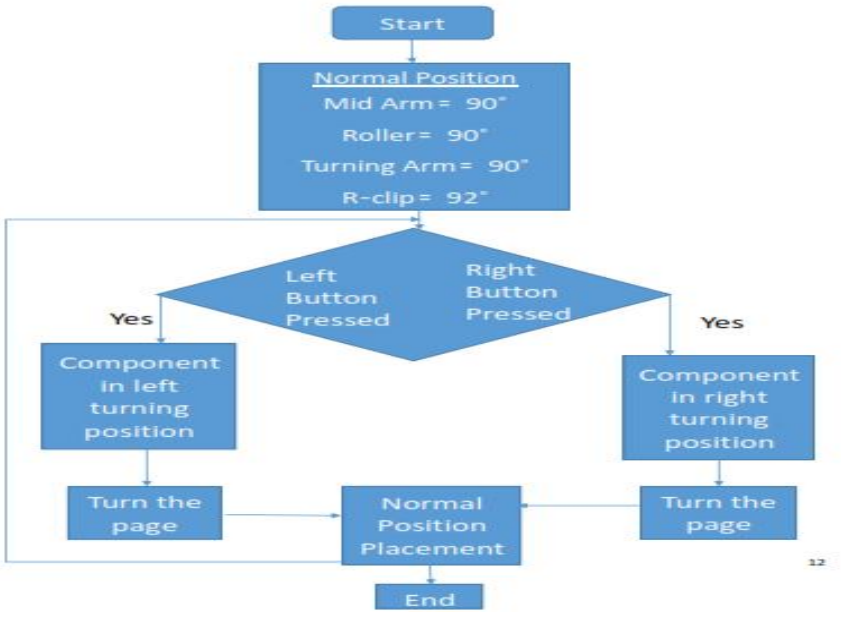
II. DESIGN DATA

NO	Component	Size/ Specification
1	Book	Length: 33 to 40.5 cm Width: 26 to 24cm
2	Roller	Diameter- 7 cm & width- 2cm
3	Support Clamp	Length- 10.5 cm, Width- 5cm
4	Rotating Clamp	Length- 10.5 cm, Width- 5cm
6	Bearing	R 42
7	Roller Arm	Length- 20.5 cm, Width- 4 cm
8	Base Structure	Length- 77.5 cm & Width- 60 cm
9	Servo motor	Torque- 3 kg*cm & 4.8V
10	Adapter	12V & 2 A



No	Component
1	Roller
2	Servo motor
4	Support clamp
4	Rotating clamp
5	Book

III. FLOW CHART



IV. WORKING PRINCIPLE

It consists of wooden structure for base and to support various components like servo motor, controller circuit, Arduino Uno, rotating rods, etc. All the parts are assembled as shown in the image. The basic program containing the commands of actuation is uploaded on the Arduino which controls the motion. When any of the two button is pressed, it will send the signal to controller circuit which will relay it to the Arduino in the digital form, then Arduino will actuate the servo motors according to program to turn the pages. The function is the roller mounted on the swinging arm is to lift the page near the joint to enable it to push accordingly but the bottom turning arm. The side clips are provided to restrict the movement of pages while reading due to wind.

Fig 1 Left page turning

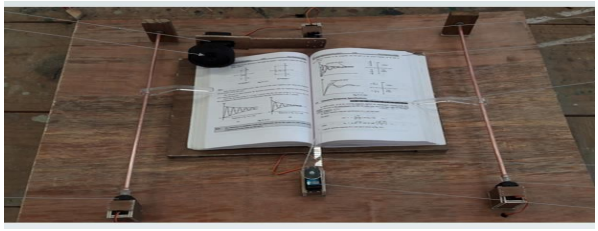
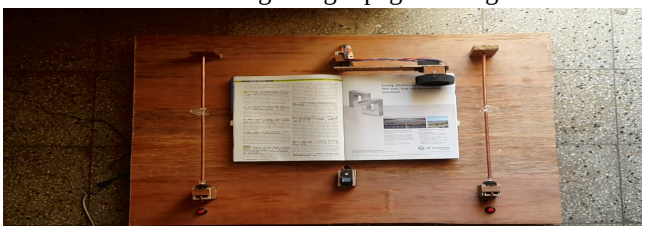


Fig 2 Right page turning



V. CONCLUSION AND FUTURE SCOPE

The model is light in weight, easy to use and portable. This mechanism takes 4.5 second to turn the page in forward or reverse direction. Accuracy of turning the pages is depend upon surface roughness of pages. Cost of the devise is also low compare to existence mechanisms. Voice sensor can also be used to turn page.

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PROGRAM

```
#include <Servo.h>
Servo midarm;
Servo roller;
Servo turner;
Servo r_clip;
Servo l_clip;
void setup() {
```

```
        Serial.begin(9600);
        midarm.attach(8);
        roller.attach(9);
        turner.attach(10);
        r_clip.attach(11);
        l_clip.attach(12);
        pinMode(6, INPUT);
        pinMode(7, INPUT);
        pinMode(A0, INPUT);
        pinMode(A1, INPUT);
        midarm.write(90);
        roller.write(90);
        turner.write(90);
        r_clip.write(90);
        l_clip.write(86);
}

void loop() {

  int r1 = digitalRead(6);
  int r2 = digitalRead(7);
  char r = Serial.read();
  Serial.println(r);

  if (r == 'n' or r1 == HIGH){
      turner.write(5);
      roller.write(180);
      r_clip.write(180);
      l_clip.write(0);
      delay(900);
      midarm.write(40);
      delay(500);
      midarm.write(12);
      delay(500);
      int pos;
      for (pos = 180; pos >= 80; pos -= 1){

      delay(15);
      roller.write(pos);
      }
      delay(500);
      turner.write(90);
      delay(200);
      midarm.write(30);
      delay(200);
      turner.write(180);
      delay(800);
      turner.write(90);
      midarm.write(90);
```

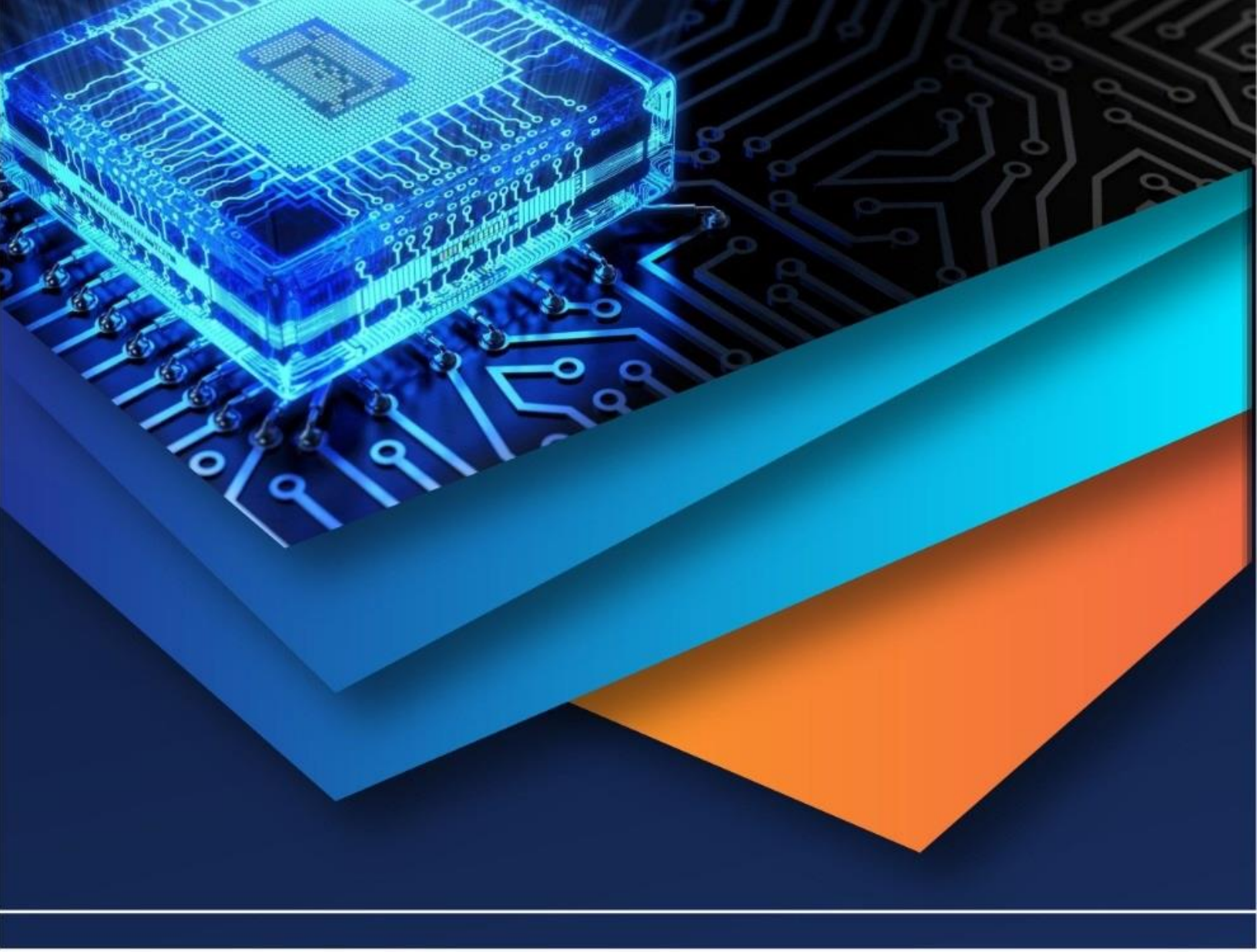
```
      delay(30);
      roller.write(90);
      r_clip.write(90);
      l_clip.write(86);

  }

  if (r == 'p' or r2 == HIGH){
      turner.write(180);
      roller.write(0);
      r_clip.write(180);
      l_clip.write(0);
      delay(900);
      midarm.write(155);
      delay(500);
      midarm.write(180);
      delay(500);
      int pos;
      for (pos = 0; pos <= 120; pos += 1){

      delay(15);
      roller.write(pos);
      }
      delay(500);
      turner.write(90);
      delay(200);
      midarm.write(150);
      delay(200);
      turner.write(45);
      delay(800);
      turner.write(90);
      midarm.write(90);
      delay(30);
      roller.write(90);
      l_clip.write(86);
      r_clip.write(90);
  }
  :

}
```



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