ROBOTIC ARM BASED LIBRARY AUTOMATION USING HAPTIC TECHNOLOGY

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Abstract- **The main objective of this project is to just pick an object and the place the object in a desired position. this project focuses on picking the object with automated robotic arm like structure with a clamp. And the arm is then fitted on a movable chassis so that it can be moved over various locations. The object is thus sensed using a RFID reader and hence based on the signal thus received the object is picked up and hence replaced. This is the main objective of our projective and hence it is mainly designed for the library purpose for arranging the books in order. Hence our project is mainly designed in order to reduce the work force in the industrial area and public services. The programs are thus encoded in the sanguino board and the platform we are working on is the arduino and thus based on this basic operations of the robotic arm are thus performed.**

KEYWORDS: Pick an object, Robotic arm, RFID reader, Sanguino board, Arduino.

I. INRODUCTION

The movement of the arm is done using the crank like structure which is used for the lifting the arm up and down. And a separate DC geared motors are thus used for the rotation of the arm around a 360 degrees rotation and hence as the rod rotates and hence a clamp which is fitted at the edge of the rod and hence clamp which is used for picking the object and which has an motor for rotating the clamp and hence these are some of the basic operations of the arm and hence for movement of the arm through various locations the arm is placed over the chassis and hence these are the basic modes of operations of the arm. Similarly the chassis also moves with desired directions and hence the movements are sensed using sensors and the object is thus sensed using the RFID reader and thus by the basic operations are thus performed. Then the wheels at the four ends of the chassis are thus controlled using the DC motors and a wooden plywood is covered at the top of the chassis and hence over which the crank is thus placed and hence the crank is in the cross shaped and over which the arm is thus placed.

II. LAYOUT OF THE ARM WITH THE CLAMP

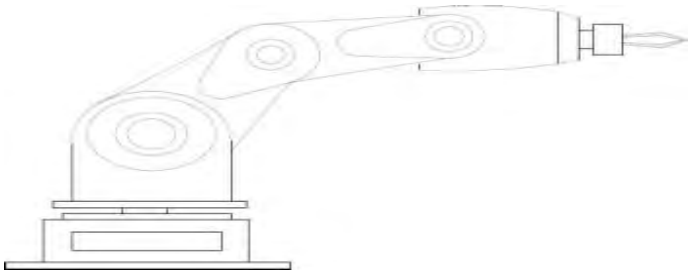

Figure 1.Layout of the arm

This is the basic layout of an arm with a clamp which is thus used for picking up the objects. Separate motors are used for the rotation of the arm hence in this case a dc geared motor of certain range are fitted along the rod and the clamp is connected to the end of the as the rod rotates the clamp thus rotates simultaneous and a separate motor is fixed at the clamp for picking up the object. Initially the motors at the rod thus rotates around a 180 degrees rotation and then an separate motor which is fitted at the clamp thus used for the movements of the clamp and the rod which is fitted over the crank thus lifted to the desired heights in which the object are thus placed. The crank which is in the shape of the cross X shaped and hence and the crank is connected to the motor which is interface with the teeth placed over the track and as the teeth moves over the track the crank thus moves and simultaneously the arm thus rotates. As the process thus proceeds hence the the crank thus moves slowly upwards with respect to the movement of the motors in opposite directions and also the position of the clamp is also raised and the desired position of the object is thus reached. Hence this is the basic mechanism of the robotic arm with a clamp.

III. ATMEGA 644p (MICROCONTROLLER)

The working platform for our project is arduino and hence we are using the sanguino kit for programming and which consists of the controller embed in it and hence the main purpose for using this controller is that it consists of maximum voltage range of 1.8v and frequency In the range of 20Mhz. Thus once the data is fed in to the board it thus runs and the desired actions are the performed. Thus it has various features such as highly non volatile segments also can be operated under high temperature. ATMEGA 644p also serves as a best barrier for the basic movements of the arm

Motors we use in this paper are chosen based on the value of the torque we obtained. As we know that (torque= mass * acceleration) [i.e. (torque= m * a) and the weight of the object is 1kg and total weight of the arm is 20kg thus the force required for lifting up the object and replacing are thus calculated and hence in this case the torque value was found to be 7.27 kg cm considering various external factors based on these specifications the motor is thus chosen and hence it can bear a load of weight 20kg and its speed is about 10RPM. The motor also has an staring torque of 42 kg cm and has an no load current of 800 mA and load current of 7.5 A . The 10 RPM DC geared motor has ten rotations for a minute and hence the speed of the can be varied using the metal gears and thus the diameter of the motor is about 28.5mm and the gear is 37mm and its shaft length is 15mm and the overall weight of the motor is 180gm and thus these motors are fitted on the base of the chassis for the movements also at the arm for rotation around 360 degrees. Hence the movements are thus done.

IV. H-BRIDGE DRIVER

An H bridge is an electronic circuit that enables a voltage to be applied across a load in either direction. These circuits are often used in robotics and other applications to allow DC motors to run forwards and backwards. H bridges are available as integrated circuits, or can be built from discrete components.

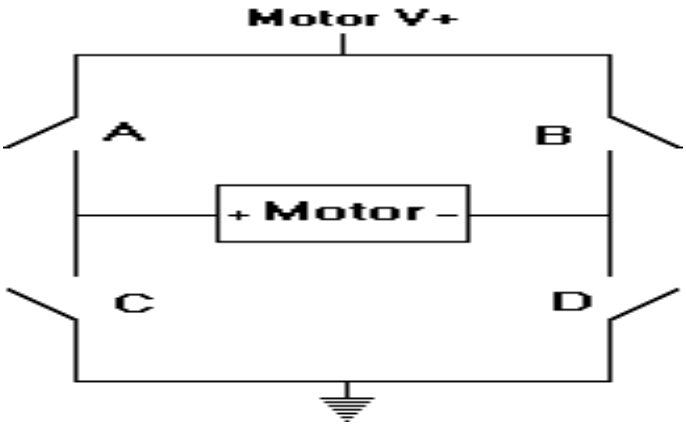

Figure 2. H-Bridge Circuit

V. LAYOUT OF THE CHASSIS

The chassis is designed based on the weight of motors and the arm. The overall dimensions of the chassis is (70*40cms) and the length of the rod is 70cms and the breadth of the rod is 40cm and hence it is welded and the over structure is obtained in the form of rectangle. A track is placed at the center of the chassis and over which the teeth is made to move over the line of the track. The wheels are fitted along the four ends of the chassis and diameter of the wheel is 5mm since the shaft of the dc geared motor is 5mm and a sheet of wood is placed over the chassis over which the track is placed. The overall length of the chassis goes around 1.25 feet large and the

width of the rod is thus half feet broad and hence they are sized as the chassis are thus designed the motors are thus fitted to it and hence over which the clamp is placed. And plywood of length (70*40) is placed over the chassis and hence over which the track is thus placed and the thickness of the Wood is 5mm and hence over which the arm is thus fitted and hence the overall outlook of the chassis is shown above.

VI. RFID

The RFID (radio frequency identification) reader is used in this project for sensing of the object and the main process of the RFID reader. Hence the RFID reader thus has the basic look as shown above. Hence using this reader thus the object is thus sensed and coded. IN this paper we are thus using an RFID TTL and the frequency range of 125 kHz. Thus the necessary values are thus coded and hence the object to be sensed is thus read from the reader.

VII. SANGUINO KIT

The software codes are thus encoded in the sanguine kit and hence which is used for all the functioning of the arm, Also the sanguine is thus connected over the pc and programs that are coded over the arduino are thus stored in the sanguine board and the operations are thus made. The kit has a controller atmega 644p and also a driver IC. All the basic movements of the arm are thus performed using the kit and the basic platform for the coading is the arduino platform. As the program are terminated the motor operations are controlled also the movement of the arm can be also controlled.

VIII. WORKING PROCESS OF THE ARM

The working process of our project is given as a schematic representation and it is given below

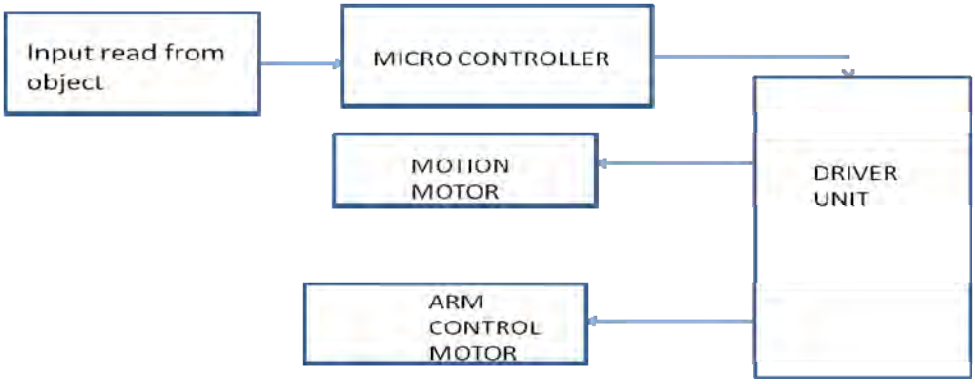

Figure 3. Flow chart of the robotic arm

Initially the input is thus read from the object then it is encoded and sent to the sanguino kit which contains the microcontroller ATMEGA 644p and then the instructions are thus spread through the driver circuit and initially the input signal thus read from the object thus processed and the instructions are fed in to the arm controller and thus the movements of the various motors are thus controlled.

IX. OVERALL MECHANISM OF THE ROBOTIC ARM WITH A CLAMP

The basic operations of the arm with the clamp consists of the following sequence , Initially the object is thus sensed and then the instructions are thus sent to the controller and the motor operations are thus processed and then it then passes the control signals to the arm controller and then the rotations of the arm is thus controlled and then the clamp gets the signals which is thus processed and then the clamp thus picks the object and similarly the next process thus takes place as the object picked by the arm thus moved to the desired locations thus calculated and then object is thus placed at the destination place. In case of the object to placed is in the second row and thus the height of the arm is thus lifted using the crank and thus as the crank is thus lifted the entire rod containing the arm thus lifted and thus the object is thus placed in the second track according to this paper the object can be thus placed at the maximum height of 55cms from the ground and thus the required object to be placed is thus placed. Hence thus similarly the object can be picked and also placed at the ground.

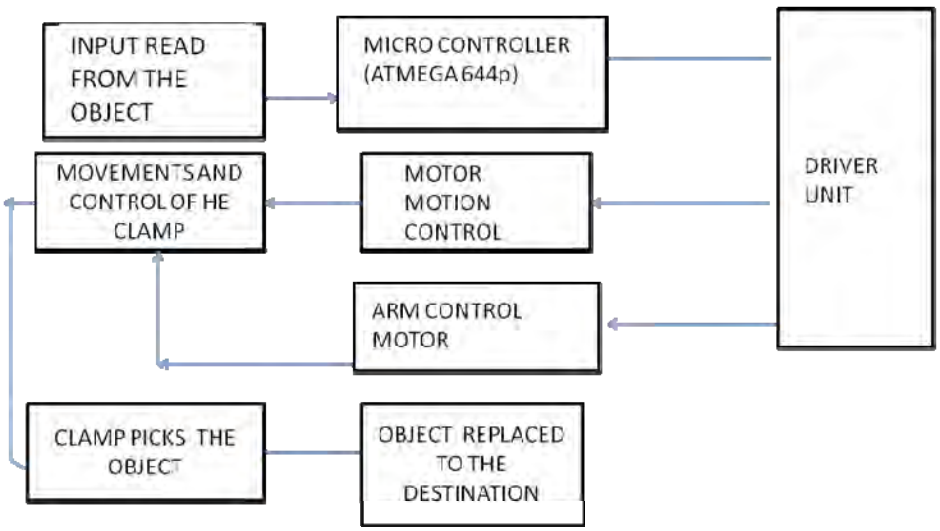

Figure 4. Working process of the arm with the clamp

A. Minimum Height

In minimum height operation, two motors which are used for lift the arm2 that motors present in the extreme of the chassis. Then the clamp gets minimum height to replace the object.

When the two motors present in the middle of the chassis, then we provide 01inputs to the motors to move the motors to the extreme of the chassis.

Height of the motor =4cm

Arm2 length =36cm

Arm1 length =30cm

Minimum height =20cm+30cm=50cm

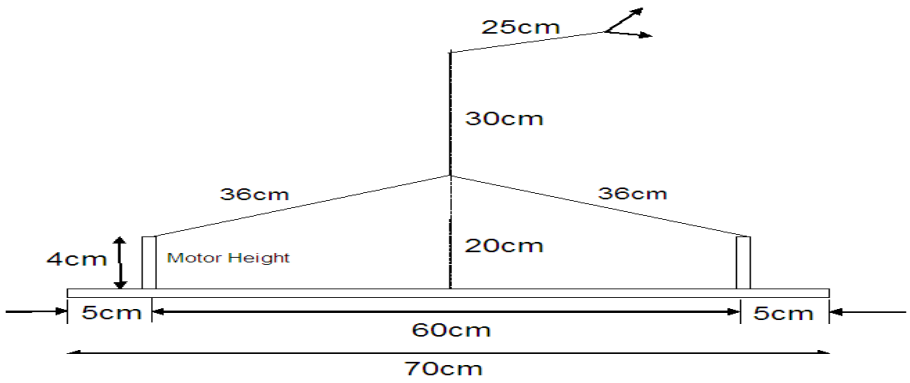

Figure 5. Minimum height of the arm

B. Maximum Height

In maximum height operation, two motors which are used for lift the arm2 that motors present in the middle of the chassis. Then the clamp gets maximum height to replace the object. When the two motors present in the extreme of the chassis then we provide 10 inputs to the two motors to move the motor to middle of the chassis.

Height of the motor =4cm

Arm2 length =36cm

Arm1 length =30cm

Maximum height =36cm+30cm+4cm=70cm

In case of the maximum position of the arm the movement of the motor is made to rotate in the forward of clockwise direction. The height of the arm is gradually increased to its maximum height and the object is replaced to the height above from its initial point.

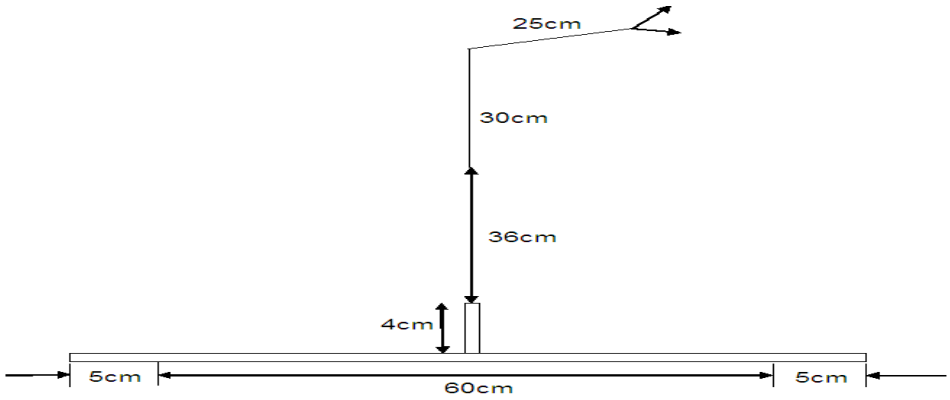

Figure 6 Maximum height of the arm

From the graph we observe that the peak current of 0.82A occur when the robotic clamp encounters a vertical grip when the object of 1kg is picked. The minimum value of the current is in the when the object of 0.25kg is lifted and the graph varies almost in a linear fashion till the weight of the object crosses its limit. Once the object is replaced the current value gradually decreases as per the rigidity of the clamp and the torque to pick up the objects.

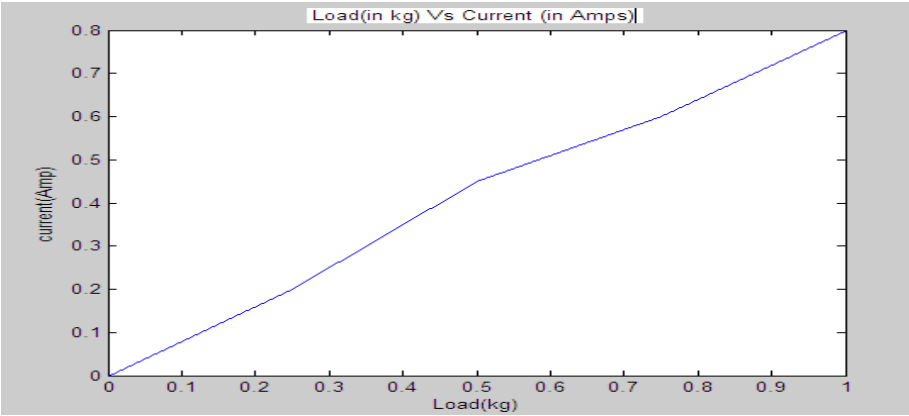

Figure 7 Characteristics of object load and current rating

X. CONCLUSION

In this paper the picking and positioning of the object using the robotic arm with the clamp was dealt and the object is thus sensed using the RFID reader and hence it is mainly designed for the library. And hence the height of the arm can be moved up to 58cms from the ground and thus and the clamp can rotate according to the direction of the book placed in the rack and hence the cost of this object is nominal and working operations of the arm is also simple. The main purpose of the arm is to reduce the human work and also accuracy. Hence this project is to give the way for providing bigger effective purpose for library applications.

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