PROJECT REPORT AS ON **30 NOV 2011**

BE PROJECT 2011-12

**CHARACTER WRITING ROBOT**

Team 06

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**Introduction:**

A robot is a mechanical or virtual intelligent agent that can perform tasks automatically or with guidance, typically by remote control. In practice a robot is usually an electro-mechanical machine that is guided by computer and electronic programming.

Autonomous robots are robots that can perform desired tasks in unstructured environments without continuous human guidance. Many kinds of robots have some degree of autonomy. Different robots can be autonomous in different ways. A high degree of autonomy is particularly desirable in fields such as space exploration, cleaning floors, mowing lawns, and waste water treatment.

The Robot that we are going to built will be able to write with a pen on a paper. The firebird programming board with ATMEGA16 microcontroller controls the execution of the program. A mechanism is used to hold the pen and write on the paper. As the mechanism available (i.e. gripper) is very heavy for the firebird robot to hold, so we will make a robust robot body and a robust mechanism to move the pen in different directions.

The mechanism made will be installed on the robot body and as the mechanism moves the pen will trace it and eventually form a character. The input to the robot will be random and will be given by the user from the computer window. Now it is assumed that a user will feed only capital block of characters as the robot for now can write capital fonts only. So in whatever way the user gives the character it will be treated as a capital font only. The input character is sent to the robot using wireless communication and then the processed data is executed at the robot end.

The whole robot will work in such a way that all processing part will be done by the computer terminal and the execution part will be done by the robot controller. Input character is analyzed in the computer and only the line coordinates to draw it is sent through wireless module to the robot.

The robot uses an algorithm which makes it write straight lines very precisely, but when it comes to curves it fails to draw them. So we will be varying the motor speed in such a way that it traces a curve. Although it will not be an accurate curve but the whole character can be figured out.

The characters will be random and we are even trying to make it write a string of characters using the same algorithm.

**Hardware and software requirements:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Hardware Requirements*** | | | | |
| ***Sl.No*** | ***Hardware*** | ***Function*** | ***Quantity*** | ***Status*** |
| *1* | *Spark Robot Programming board (ATMEGA16)* | *It will be used for execution of the commands given by the user from the computer and to control various features of the robot like motion, communication, etc* | *1* | *Issued by*  *e-yantra lab* |
| *2* | *Chassis* | *It will be required to give a robust body to the robot to hold the mechanism on it.* | *1* | *Not Acquired yet* |
| *3* | *DC motors with position encoders and wheels* | *These will be required in the locomotion of the robot and also in providing strength to the robot.* | *4* | *Not Acquired yet* |
| *4* | *Mini RC servo motor* | *It will be used in mechanism for controlled movement to write the characters.* | *3* | *Not Acquired yet* |
| *5* | *Material for Rack and Pinion arrangement* | *It will be used for making the writing mechanism of the robot.* | *4 sticks and*  *4 levers* | *Not Acquired yet* |
| *6* | *ZigBee module* | *For wireless communication between computer and robot.* | *2* | *Issued by*  *e-yantra lab* |
| *7* | *Miscellaneous* | *To hold the mechanism and pen on the robot body.* | *NA* | *Not Acquired yet* |

**Work completed:**

As proposed in our presentation we have completed following work:

1. Topic selected.
2. Hardware collected from e-yantra lab.
3. Designed the mechanism and the robot body.
4. Implementing the mechanism and robot body. (Incomplete)

We have always worked on 8051 microcontroller platform and so learning the ATMEGA16 platform took some initial time. We read all the manuals and learnt how to use the boot ladders and GUI’s for the robot.

As we have never worked with zigbee before, we implemented some codes through zigbee and were successful in doing the same.

We burned the hex files through both serial communication and wireless communication to test the functionality.

We could not implement the mechanism we have designed as we has tight schedule in vivas and exams. Also the major fire which broke near Nagdevi Street delayed our planned work.

Following is the proposed design of mechanism on the robot body:

1. We will place the Spark programming board on a chassis.
2. Stepper motor with levers will be placed above the programming board.
3. Caster wheels will be used for stabilizing the mechanism outside the robot body.
4. A bent metal strip will be used to hold the pen.
5. Rack and pinion arrangement will be fitted inside a plastic/metal cover for avoiding friction.
6. Motion of the robot will perpendicular to the motion of the mechanism.

**Design of mechanism and robot body:**

Rack and pinion arrangement

Stepper motor

Pen holder

Chassis

Wheels with encoder

Pen

Spark programming board

Levers

Caster wheels

**Work planned:**

As soon as our semester exams are over we will be buying all the required hardware and implement the designed mechanism and the robot body.

The next task to be done is studying the algorithm we are using for character writing ie. Stroke method. For now we only know the basic structure of stroke method. In the coming days we will learn how to alter the method to write curves and desired characters.

**Challenges faced:**

As we are late in our planned work, completing the project in proposed time is the biggest challenge, so we have divided the next tasks among ourselves. Two of us will be concentrating on the hardware implementation and rest two will study the algorithm. This will make us complete the project on time.

Also the algorithm we are using is for making straight lines and so for making curves we will have to alter the method or think of some alternative to make characters look better.

The other challenge is the implementation of the design, as while making the mechanism physically there are going to be many unexpected problems. Some of them might be like stability of the rack and pinion arrangement outside the robot, moving pen up and down, friction between hardware parts, etc.

In order to avoid such problems we have listed such possible solutions and are constantly researching on them.