Course Project Documentation

CS 101 Project

Autonomous fertilizer spraying robot

TEAM ID -- 306

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1. **Introduction**:

In past few years there has been many cases of farmers dying due to snake bites or similar things in field while spraying fertilizers or harvesting crops. The only solution to this problem is that the farmrs should stay away from field as much as possilbe. So as a contribution to this solution we have designed an Autonomous Fertilizer spraying bot.

The main aim of designing the bot is to help farmers spray fertikizers on the crops even without stepping in the field, and along with that they can spray as much as they want.

2. **Problem Statement:**

The main aim of this project is to make an autonomous bot that can spray fertilizers on the crops in the field.

This bot will move on a predefind path on the field and will carry a cylindrical container to hold the fertilizer.

It will make stops besides every crop and then spray fertilizer.

The arena(field) will be predefind and the same info will be feeded to the bot.

3. **Requirements:**

A) Hardware Requirements

1. FireBird : Requires 2 bots (1 Attacker + 1 Enemy)
2. DC motor : 300 rpm, To rotate the contrainer so that the fertilizer will be sprayed

B) Software Requirements

1. AVR studio : To program instruction onto a given bot

4. **Implementation:**

A) Functionality:

a) **Moving the bot in the field: The bot moves in the filed using the white line follower technique. As the field area in predefined say there are 4 columns of crops with each column containing 4 crops, we know how the bot should travel .So this information is feed in the bot and then using the technique of white line follower the bot moves in the field.**

b) Stops at particular crops: This is the most important of this project, to make the bot besides every crop. To achieve this marks we have used the mechanism of wheel counter. Wheel counter gives a count of the distance travelled by the bot(not displacement) in millimeters. So as we know the distance between every crops and this distance is constant, this data is feed to the bot before it begins its journey. Using this data the bot stops after every specific interval of distance travelled.

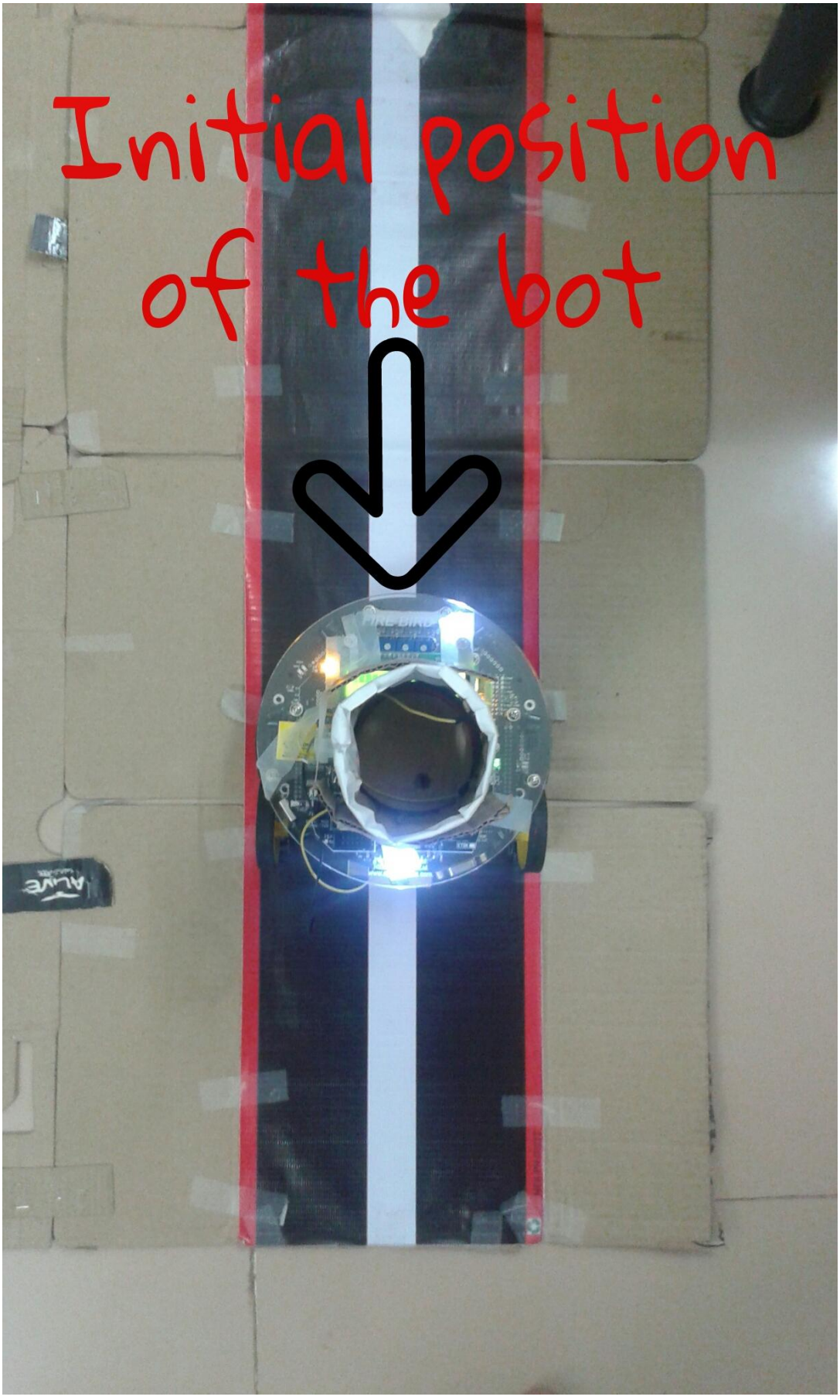
c) Spraying of fertilizers: The bot should spray fertilizers as it stops at particular crop. So for example it is being programmed to take 4 stops in a column and as soon as it stops, spray fertilizers. We keep a count of the distance travelled by the bot from the starting point so as to avoid the possibility of spraying fertilizers twice on the same crop. In case the bot gets stuck, according to the programmed it has to spray fertilizers but as we keep the track of the distance it as travelled, it will give the indication like it has not moved from its position of the last spray and the fertilizer wont be sprayed.

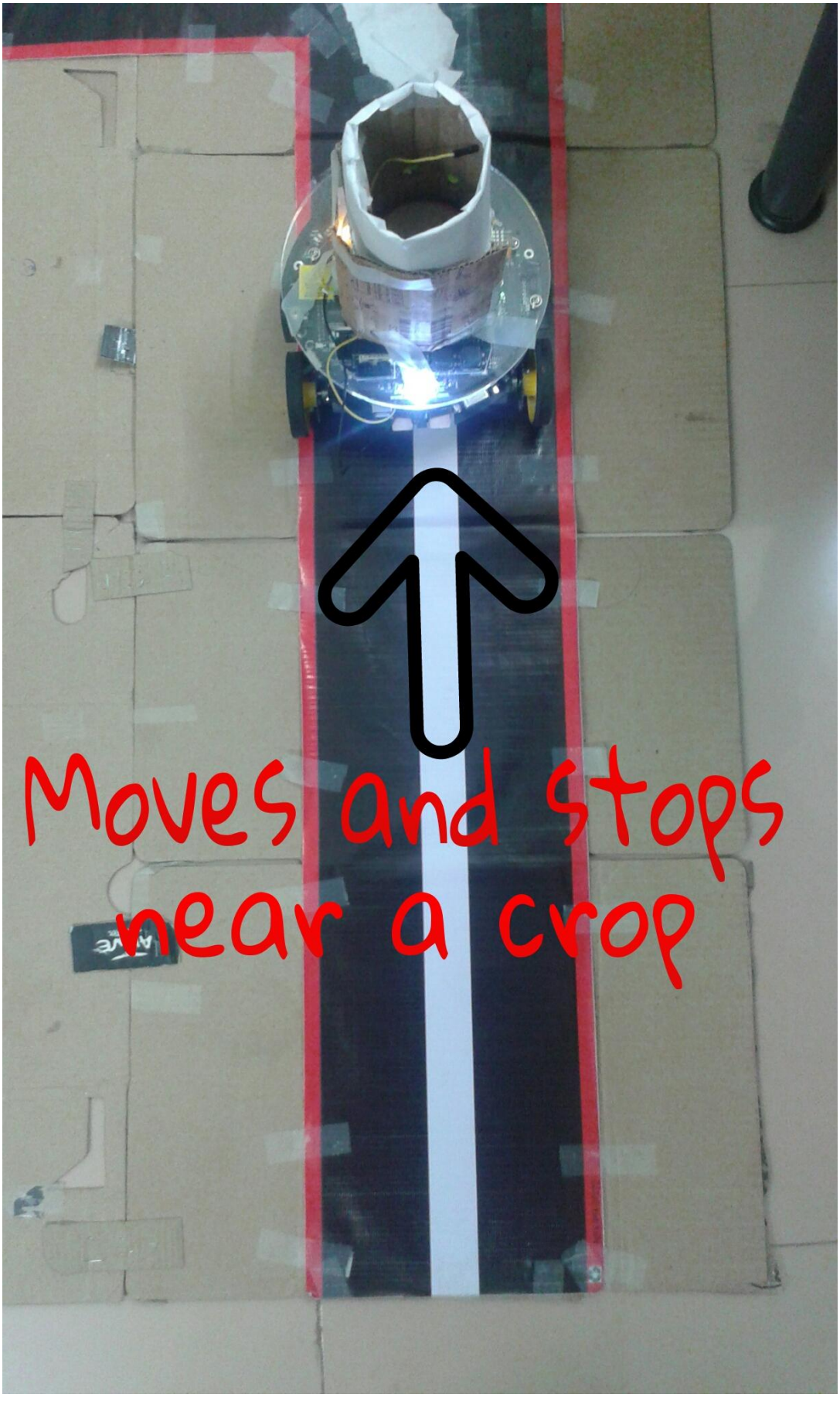
5. **Testing Strategy and Data:**

The testing module is divided into 3 parts:

➢Tracking the trajectory

Bots orientation:


Initial position
of the bot


Moves and stops
near a crop

6. **Discussion of System:**

A) What worked as per plan?

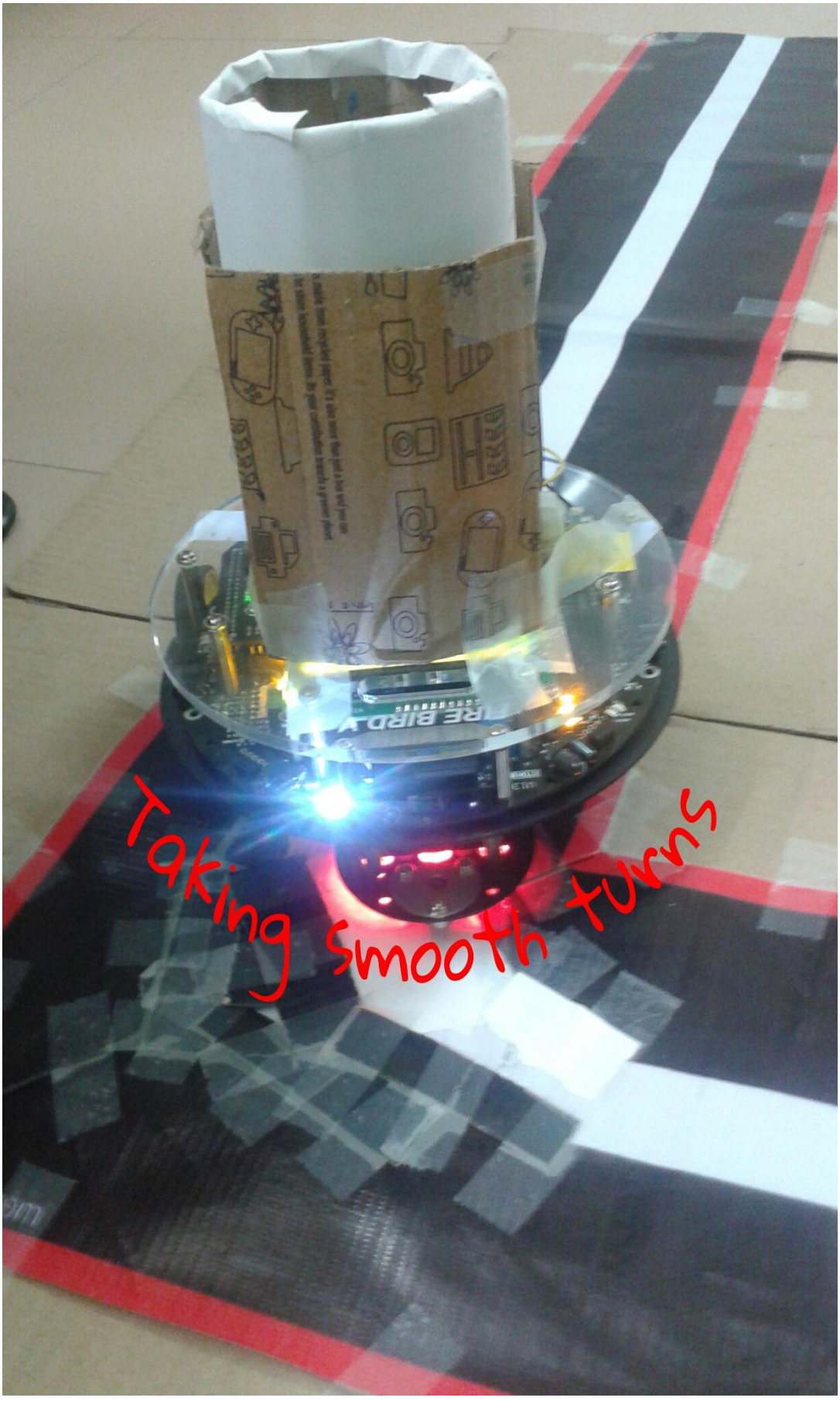
1. Directional fertilizer dispenser:

   As a cylindrical dispenser is being used to avoid the wastage of fertilizer we had to design such a dispenser such that the fertilizer is sprayed only on the crops and not on the road on which the bot is travelling. So to do so we provided the bot with blocking parts in the front and back side of the bot very close to the dispenser so the our aim to save fertilizer would come true.

2. Bot taking perfect turns:

   The only threatening part in line follower is to make the bot turn perfectly and not let it go out its track. For this by trying out various con\mbination of the smooth angle turns on the arena and using the line follower code after

increasing its' sensitivity by increasing the number of regimes of the turns we can improve the following of white line at turns , the track was created so that the bot could take smooth turns.


Taking smooth turns

3. Reaching the Plant:

   The first challenge while dispensing was to reach the plant exactly and then dispense the material. For that we used a code balanced between white line following and position encoder, so that the white line sees to it that the direction of the bot is correct while encoder ensures the intervals of distance after which the bot has to stop, also this was mixed up with the number of turns taken so that the bot doesn't dispense any fertilizer when it is in horizontal movement and only dispenses when in between the rows of the plant.

7. **Future Work:**

A) The bot can be added a moisture sensor so that it determines the humidity in the soil near the crops and then if the humidity level is below the specified one, it will add the required amount of water to it.

B) The design of the bot to stop at various intervals of time can be used to make it a garbage collector as it will stop at the door of every room and collect their garbage or waste.

8. **Conclusions:**

This project is a basic attempt to achieve the prime target that is being chased by engineers in all fields and that is the point of balance between control and automation in a given process. This bot tries to do that in the basic and very simple application of spraying fertilizers, or a variation of this bot can be used to spray water or spreading seeds or for that matter other applications like ploughing the field and so on.

9. **References:**

www.rowbot.com

www.wikipedia.org

ETRS Lab