AGRO DISPENSER INDICATOR

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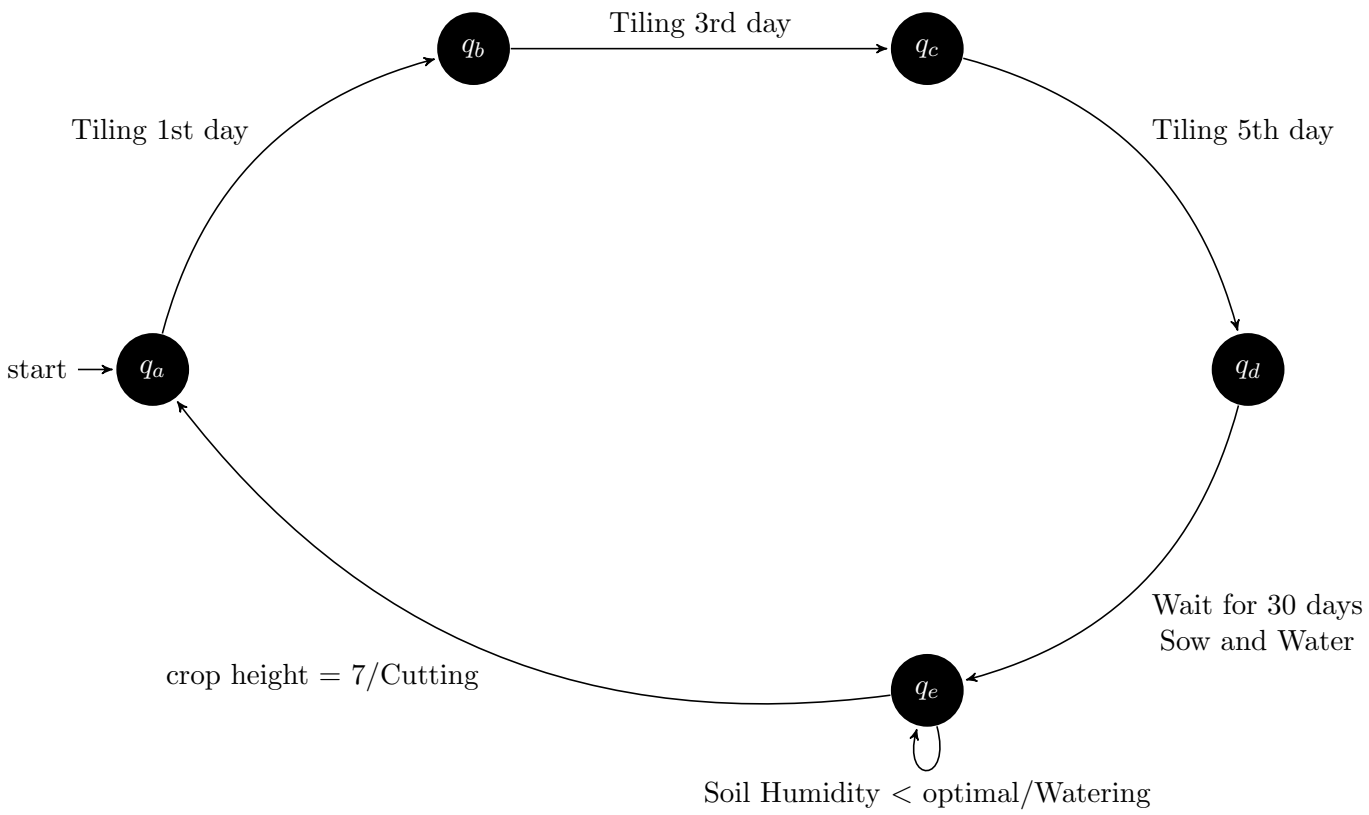
INTRODUCTION

◇ The following report describes the do-it-all agro machine . The machine has the following functions:
- Automatic watering system
- Seed dispensor
- Grass cutter
- Soil tiller
- Field health monitoring

It is an automated machine that eases the different agriculture methods and hence helps a farmer in increasing its productivity.

STATE MACHINE

1. Transition Diagram



This state diagram is for only for one of the 8 part of the whole field. The controller wil get the requests from each of the 8 parts and will send the machine to the divisions in the order in which it gets the requests.

2.Description of the machine

- ◇ Qa : This State is reset state , representing Barren land.
- ◇ Qb : This State represents the land that has been tilled for 1 day.
- ◇ Qc : This State represents the land that has been tilled for 2 days.
- ◇ Qd : This State Represents the land that has been tilled for 3 days.
- ◇ Qe : This state is reached when the tilled land has been sown and watered, that is this state represents sown land, checks for soil humidity are done daily in this state and if it is less than the required optimal humidity than the land is watered and we return to the same state. Also in this state once the crop reaches a height of 7 we cut the crop and reach the state a that is barren land.

BLOCK DIAGRAM

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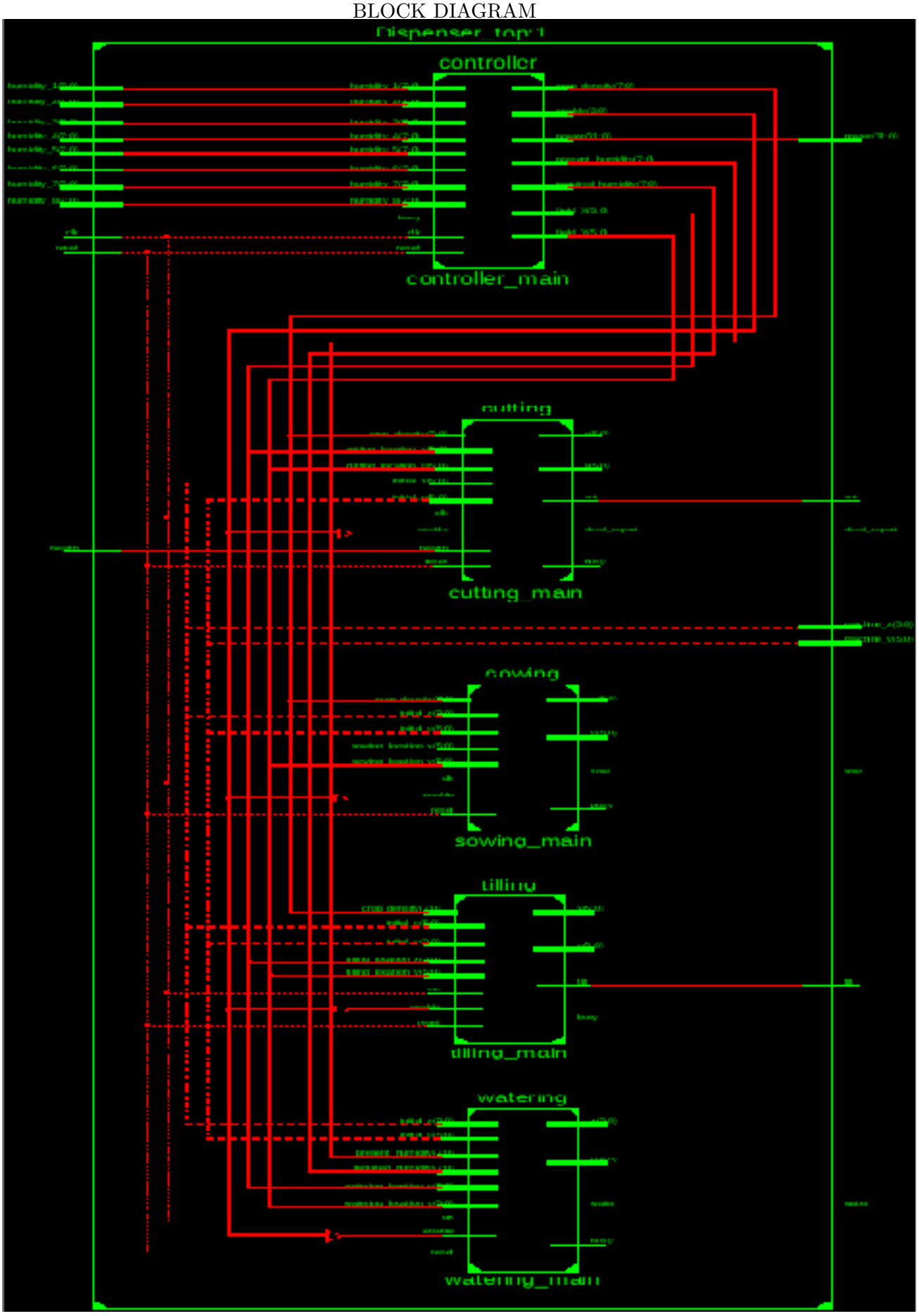

TOP MODULE

The top module is the overall module which connect all the smaller blocks. The smaller are as follows :

- ◇ Controller
- ◇ Cutting Machine
- ◇ Sowing Machine
- ◇ Tilling Machine
- ◇ Watering Machine

The input that the machine get are:
1. Humidities of each field (8 bit vectors)
2. Clock and Reset
3. Health (1 bit vector): It tells whether a crop i healthy or not (rrquired at the time of cutting

The description of each block is as follows.

1. Controller

This is the main controlling unit which governs which part of field to work on at a given time and what work to do on that part.
It consists of 8 handlers, one each for each part of the field. These handlers contains all the data for the its designatrd part of field, these data include the crop density in that area , crop growth period, optimal humidity required for that crop and the state in which that part is presently in.
At the beginning of each day these handlers gives the requirements of the associated field to the controller which saves this requests in a FIFO. The controller than starts assigning the tasks to the machine according to the entries in the FIFO.
It takes the following inputs:
1. The Humidities of each field(8 8 bit vectors)
2. busy(1 bit): tells whether the machine is busy or not at present
3. clock and reset

And gives the following outputs:
1.Crop density(8 bit vector):Crop density of the part where the machine needs to work now
2.Enable (4 bit vector): To tell which part of the machine to enable
3.Present Humidity: Required only for irrigation system
4.Required Humidity:Required only for irrigation system
5.field_x and field_y: Gives the bottom left coordinate of the part of field where the machine needs to work

2. Cutting Machine

This block does the cutting the crops of the field according to the inputs given.
The inputs are as follws :
1. Cutting_Location_x and Cutting_Location_y: Bottom left corner of the part where cutting needs to be done.
2. initial_x and initial_y: Initial location of the machine
3. crop density : Crop density of the required part
4. health: 1 bit vector indicating whether the crop is healthy or not
5. Enable: Indiacting whether to activate the cutting submachine or not
6. clock and reset

The outputs are as follows:
1. x and y coordinates: coordinates of the machine at a given time
2. cut (1 bit): high whenever the machine is cutting
3. Busy (1 bit) : high whenever machine is active
4. dead_report : to report a dead crop

3. Sowing Machine

This block does the sowing the seeds in the field according to the inputs given.
The inputs are as follws :
1. Crop Density : The density with which the crop needs to be sown
2. Initial_x and initial_y: initial coordinates of the machine.
3. Sowing_location_x and Sowing_location_y :Bottom left corner of the part where sowing needs to be done.
4.Enable: Indiacting whether to activate the sowing submachine or not
5.clock and reset

And the outputs are:
1. x and y coordinates: coordinates of the machine at a given time
2. sow (1 bit): high whenever the machine is sowing
3. Busy (1 bit) : high whenever machine is active

4. Tilling Machine

This block does the tilling of barren land according to the inputs given.
The inputs are as follws :
1. Crop Density : The density with which the crop needs to be sown
2. Initial_x and initial_y: initial coordinates of the machine.
3. tilling_location_x and tilling_location_y :Bottom left corner of the part where tilling needs to be done.
4.Enable: Indiacting whether to activate the Tiling submachine or not
5.clock and reset

And the outputs are:
1. x and y coordinates: coordinates of the machine at a given time
2. till (1 bit): high whenever the machine is tilling
3. Busy (1 bit) : high whenever machine is active

5. Watering Machine

This block does the job of watering the field according to the inputs given.
The inputs are as follws :
1. Crop Density : The density with which the crop needs to be sown
2. Initial_x and initial_y: initial coordinates of the machine.
3. watering_location_x and watering_location_y :Bottom left corner of the part where watering needs to be done.
4.Enable: Indiacting whether to activate the Watering submachine or not
5.Present Humidty : The present humidity level of the needed part of field

6.Required Humidity : The required optimal humidity of the crop in the needed part of the field
7.clock and reset

And the outputs are:
1. x and y coordinates: coordinates of the machine at a given time
2. water (1 bit): high whenever the machine is watering
3. Busy (1 bit) : high whenever machine is active

ASSUMPTIONS AND CONSTRAINTS

1. Assumptions

- ◇ The land is divided into eight equal divisions.
- ◇ The agro-dispensor machine is a do-it-all machine, so no two functions are done at the same time.
- ◇ On reset, the machine starts from (0,0).
- ◇ The rate of growth of the crop is such that it reaches the maximum height in the given duration.
- ◇ Watering will be done unless current humidity becomes greater than or equal to required optimal humidity
- ◇ The field dimensions are 40*40 sq. metre and the field is divided into 8 equal divisions of 10*20 sq. metre.
- ◇ Crop density can be only one of the following: 1,2,5,10,20,25,50,100,200 and 250. this is to ensure fix spacing between different rows of crops and the crops in a single row.
- ◇ 1,00,000 clock cycles span a day.

2. Constraints

- ◇ The speed of the machine is 1 meter/min
- ◇ Crop cutting rate is 1 crop/sec
- ◇ Since it is a single machine , there cant be parallel processing.That is , it cant be present at two different locations.
- ◇ If all the tasks added to the FIFO in a given day are not completed within that day than no new task would be added to the FIFO on the next day or any following day until all the tasks of day 1 are completed. This is to minimize carrying over of one days work to the next day.

WORK DISTRUIBUTION

Naveen Kumar

- ◇ Jointly Coded the Irrigation System, Cutting System, Tiling system, Watering system and Test Benches.

Yathansh Kathuria

- ◇ Jointly Coded the Irrigation System, Cutting System, Tiling system, Watering system and test Benches.

Rajat Chaturvedi

- ◇ Jointly Coded the Controller, Handlers and Test Benches.

Suman Swaroop

◇ Jointly Coded the Controller, handlers and Test Benches.

REFERENCES

[1] For Drawing State Transition Diagram:
`http://tex.stackexchange.com/questions/45734/drawing-graphs-in-latex`

[2] For Block Diagram
`www.draw.io`