DESIGNING CONSTRUCTION ABILITY TREE IMPLEMENTED
COGNITIVE ARCHITECTURE [CSIA] FOR AGRICULTURAL RIPED
FRUIT PLUCKING COMPARED WITH METATHINKING LAYER
AGENT

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ABSTRACT: Here is a vast abundant demand aimed at mechanization in the field of agriculture. The Improvement of Robotics technology is daily exponential this research paper primary concentrates in fruit-plucking robots. Implementing intelligent robotic machine learning to make the robot adapt itself in non-deterministic environment, which can work in the fields, with or without farmer. This paper is associated with aimed at to get the solutions and algorithms for computers to match human and non-human like behaviours, the ability to think, similar to peoples and animals in the everyday life. This Includes, testing cognitive principles of mind on robots. Performance evaluation of Industry or agriculture based robots in real time environment can be compared against human performance. Building robots using control architectures based on cognitive science, understanding the   requirement of a farmers in the agriculture land, and implementing the intelligence   device so that, machine can work as per the requirement of a farmer. For example land ploughing work, Fruit plucking etc.

I. INTRODUCTION

As we are Indians our main occupation is agriculture. We are growing economically strong day to day, one of the reason for it is agriculture. This is the field our economy is based on. In early days of our civilization we were not that strong in agriculture, it remained under developed. India had to buy food grains from other countries. Now when we think of agriculture India is one among the strong countries in cultivation and we produce food-grains more than what is required. Improvements in agriculture was seen with the help of our five year plans. India is now sufficient in agriculture.   Agriculture is very much required for mankind .It is about the cultivation of animals, plants and fungi for food and other products. When we consider agriculture the first thing that comes to our minds is cultivation i.e. cultivating food materials like wheat, cereals, fruits, vegetables etc Issues In Agriculture

Small and Fragmented Land-Holdings

Less than 2 acres of land is held by closely 80% of the 140 million farming families The farmers can increase their productivity if they have large land holdings and by implementing modern agricultural technology in it. If the farmers have small landholdings it would be difficult for them to use agriculture technologies and this might result in less productivity. When land holdings are small, many people work in the same lands invariably in most of rural regions and they are have less technology which results in decrease in income ,although the farmers have put in lot of Effort to cultivate in that small land holding.

Seeds

For higher yield of crops the basic thing that is required is seeds. We use seeds to cultivate various food-grains at the same time we should think about the production of seeds which is very difficult task. Actually good quality seeds are not available to many farmers those who are poor and those who can afford less investment on seeds because high quality seeds are exported and those which are present here also are at   high prices.The Government of India has established the National Seeds Corporation (NSC) in 1963 and in 1969 The State Farmers Corporation of India (SFCI) in order to solve this problem To increase the cultivation of land in our country which intern increases the production of food grains, a major thrust plan which is High Yielding Variety Programme was developed. When we consider Seed industry it is not about only cultivating seed of good quality but also has to consider the seeds that will be suitable for all climatic conditions. This industry has shown us a massive growth in the production of seeds earlier and they are trying to do the same even in future.Many policies are established in order to provide all kind of farmers with good quality seeds at reasonable price when required so that the cultivation increases and which results in high yield of food grains, Thereby increasing the economy of the country. By this the security goals are met.

Manures, Fertilizers and Biocides

Since years we are growing crops in our soil without even thinking about the replenishment which has led to removal of the nutrients and other resources for further cultivation. This resulted in poor productivity .In order to replenish the soil we have to add manures and fertilizers to it.Nourishment of soil is required which can be done with the help of manures and fertilizers .Care has to be taken even to soil so that our productivity increases. From the survey conducted we see that about 70% of productivity increases due to fertilizers. The best manure for the soil is cow dung .We can also have various other techniques in order to have more amount of natural manures. Natural manure can also be obtained by collecting the vegetables and fruits that are rotten and other wastes except the food materials like rice which is cooked in some vessel which is not subjected to water by any means and then they are spread across the plants which is the manure. Cow dung which was used as manure are also used as fuel for cooking which has reduced the manure present to soil. As the population in rural areas is increasing there is a demand for the fuel for which fire woods are being used. To increase the cultivation chemical fertilizers are used which is costly and may be hazardous to the people. We have to preserve fertilizers and manures to increase the productivity.

Irrigation

Irrigation is very much required for cultivation, it plays a major role in farming. After China it is India which is the largest irrigated country even then though only one third of the land is below irrigation. Irrigation is very much required in countries like India where we cannot predict the climatic changes and rainfall. It is not possible to carry of farming without the assurance of irrigation at least to half of the crops. In Haryana and western part of Uttar Pradesh we find that half of the crops of cultivation will be below assured irrigation which resulted in successful farming. Many of the countries are trying to have this kind of irrigation for benefiting in the yield of food-grains. We should take care of the irrigation which is happening with the help of canals. Many parts in India are experiencing the loss in food grains due to the lack of proper irrigation facilities.

Lack of Mechanisation

In many parts of country we use ploughs sickle and other tools for farming .Most of the agricultural processes are carried out on human hand which takes more time for cultivation. Labour force is being used in agriculture in all the steps which has shown decrease in the productivity at less time. By bringing in the concept of mechanizing the various field in agriculture it would be possible to speed up the process .With the help of mechanization that is nothing but bringing robots in all the fields will allow us to cultivate the multiple crops at a time, it also helps in harvesting the crops as soon as possible after they are cultivated. In order to have good hold in agriculture and to fasten the productivity we have to bring in this concept of robots.

oil erosion

Soil erosion is caused by wind and water that is nothing but it washes away the plants that are cultivated in those areas. Proper treatment of these areas has to done in order to use the fertile land again for cultivation. Soil erosion since it washes out the lands which are rich in fertilizers we may lose the cultivation of that particular land, Replenishment of these lands is not that easy. We should take care that cultivation should not be carried in those places where we can predict soil erosion.

Agricultural Marketing

Agricultural marketing is very poor shape in rural India. Due to lack in sound marketing facilities, the farmers are forced to focus and depend in local businessmen and traders for selling their produce which was cultivated

at throw-away price. In many cases, the farmers is compelled, under socio-economic conditions, to experience the pain due to the distress sale of their produce. Since the farmers borrow money for their investment on cultivation, we have seen most of the farmers of small town sell their produce to the money lender from where they have borrowed money. According to survey conducted we see that 85 per cent of wheat produced and 75 per cent of oil seeds in Uttar Pradesh, where has in Punjab 90 per cent of Jute and in West Bengal, 70 per cent of oilseeds and 35 per cent of cotton is selled by the farmers with in the village itself. Such condition arises due to the inability of the poor farmers to wait for long time after the harvest of their crops. The small poor farmer are compelled to sell the produce at whatever price is offered to them. The Rural Credit Survey Report rightly reported that the producers in general sell their produce at an unsupported place and at time which is not favorable and usually they get unfavourable terms. The absence in organised marketing structure has resulted in domination by private traders and distributors in the marketing and trading field. The load on the consumer is increased due to the remuneration of services provided by the middlemen, even if the producer does not provide the similar kind of profit out of it.Most of the market surveys have estimated that the middlemen take away for about 48 per cent of the price of rice, groundnuts is about 52 percent and for potatoes it is about 60 per cent of the price that is offered by consumers. The government has come out with regulated markets in order to save the farmers from the financiers and traders. These markets provides us a system of competitive buying, supports in removing malpractices, ensure the use of standardised weights and measures and bring up   suitable machinery to eliminate the disputes thereby confirming that the producers are not subjected to exploitation and to receive remunerative prices.

Inadequate storage facilities

Due to lack in storage facilities in rural areas, the farmers will be forced to sell their produce at low cost that is at the prevailing market immediately after the harvest. [1]These kind of situations will decrease the income of farmers. The Parse Committee found that the post-harvest losses at 9.3 percent in which nearly 6.6 percent is due to lack of storage conditions. To avoid or to overcome these losses it is required to consider scientific storage and implement, which will help farmers and consumers as well. The Food Corporation of India (F.C.I.), the Central Warehousing Corporation (C.W.C.) and State Warehousing Corporation, These are the important agencies involved in warehousing and storage activities.   These agencies are helpful in building up buffer stock, which can be used when needed. The scheme for establishment of national Grid of Rural God is implemented by The Central Government. This scheme helps in providing storage facilities to the farmers near their lands and in specific helps the small and marginal farmers. Establishing a group of Rural Storage Centres to be able to serve the economic interests of the farming community has been recommended by the working group on additional storage facilities in rural regions.

Inadequate transport

Transportation is required in agriculture to carry the food materials cultivated by farmers to the market after the harvest, Which is main source of income for farmers .Even now in many villages there is no proper transportation facility which doesn't connect them to markets at the right time and incur lose to them. In many places Like Kerala they have bullock-carts roads which becomes useless in rainy season. In these kind of situation they are compelled to sell in the local market with low price instead of carrying their produce to main market. Each and every village roads should be connected to main road .The roads should be built in such a way that they are useful in all seasons and which help the farmers brig their produce to the main market easily and benefit out of it.

Scarcity of capital

Agriculture Industries are very much required and very important .Like investment is required for any other industry even agriculture industry depends on the capital investment. Since the agriculturists invest their money on land and stocks, their money is blocked for this purpose. Here is the situation where they are forced to borrow money from money-lenders, traders, and commission agents in order to meet up with the advancement in farm technology. According to the survey conducted by All India Rural Credit Survey Committee the share of money lenders is about 68.6 percent of total rural credit in 1950-51 and their share declined to 43 percent in 1975-76.Which shows that depending on money-lenders are decreasing day by day because of many agencies that is setup that includes Central Cooperative Banks, State Cooperative Banks, Commercial Banks, Cooperative Credit Agencies and some Government Agencies are extending loans to farmers on easy period.Farmers play a vital role in agriculture without whom agricultural is not possible. Agriculture has various issues as per the discussion done previously the lack of mechanisation is one important issues ,Cultivation is done with the help of labour force if we bring in robots in agriculture it might support in many fields of agriculture and minimise the usage of labour force. We can expect the robots performing agricultural tasks autonomously such as spraying and mechanical weed control, fruit picking, watching the lands day & night for an effective report, allowing farmers to reduce the environmental impact, increase precision and efficiency, and

manage individual plants in novel ways. Farmers has to work in all seasons in order to produce different crops, Which sometimes not possible due to various conditions .In these case bringing robot in agriculture has helped to overcome all these problems. Agriculture robots paly a very important role in agriculture. Today we use robots very frequently in harvesting stage. There are various kinds of robots used in different fields of agriculture like Robot for weed control, Forester robot, Robot in horticulture, Fruit picking robot, etc. There are different and specific kind of harvest robot for specific fruits and vegetables .When we consider fruits there are different varieties, few fruits are delicate and few are hard and they differ in its colour, shape, size etc. So all these consideration has to be remembered while harvesting.

Prevailing System
The fruit-plucking robots have few drawbacks. One such drawback is driverless engineers for agriculture is its accountability. Robots are going change the culture of agriculture. Energy issues is proven to be expensive. Few shortcoming of fruit-plucking robots are:

Fruits is protected by leaves and branches.
The robots has pluck the riped fruits without destroying the branches and leaves. Individual are able apply their conceptual expertize. More consideration is given to the details of the shape of the fruit, color of the fruit. But the robots has to use their image processing technique to identify riped fruits. So the use air jet is used to blow out the leaves and then to pluck the riped fruits.

Force applied to the fruits will destroy the fruits
The force applied on fruits while plucking the fruit will destroy them making the fruits no longer eatable. People will make use of their critical thinking skills. They observe, interpret, analyze, infer and evaluate their decisions. [3]According to their decision they will apply the required pressure and pick the fruits.[2] This results in picking the fruits without damaging. The robotic arm is made of rubber to minimize the damage occurred while picking the fruit.

The fruit-plucking robots cannot differentiate between ripe and unripe fruit
People are cable of using their decision making skills, knowledge of concepts that they have already learnt and decide whether a fruit is ripe or not. They compare the results of the previously plucked fruits and hence they will correctly select the ripened and unripe fruits. The robots will rely on their image processing techniques. A camera will be placed on the top. It captures the size, color, weight, shape of the fruit. This image of the fruit is compared with previous images of the fruits and is classified accordingly as ripe or unripe fruit. But this image processing might fail in unfavorable conditions. The fruit might look ripe when compared with its color, but actually the fruit is unripe. In such cases the robot will misinterpret this result and classify it as ripe fruit and plucks it.

They cannot discriminate between the color of the leaves and color of unripe fruits

Humans will have knowledge about the problem solving skills. They examine and then discriminate between the fruit and other parts of the tree. The robot again has completely depend on its image processing capability to identify the shape and density of the fruit. This will be compared with its previously captured images. Then it comes to a conclusion which may be correct or incorrect.

They pluck the fruits by destroying leaves and branches
Humans think logically. They work creatively in order to pluck fruits without destroying leaves, branches and other parts of the tree. In robots, the robotic arm is made of rubber. This will lessen the damage but will fail to prevent the damage from occurring. All the above mentioned scenarios are some of the drawback of existing fruit-picking robots. We are focusing on the shortcoming that the inability to discriminate between ripened and unripe fruits during fruit-plucking. An agricultural robot will be equipped with intelligence so as to be able to robustly operate in the unstructured, dynamic and hostile agricultural environment. The proposed solution is to develop a cognitive architecture [1] where the agents exhibit different levels of thinking. The prime focus is acquisition of sensorimotor skills. The robots have to discover their own body and acquisition of associated cognitive skills such as self and non-self-distinction.

Design Of Fruit Plucking Robots
The fruit picking robots are designed overall with the considerations of the above shown as such the topics were used to cover for the fruit picking robots where the high tendency robotic technology is used and the due to the heavy design and impact of technology the fruit picking robots in Fig 2.1 are able to process in the same way as required by the researchers and the farmers

Fig 2.1Design of Fruit picking Robots

Horizontal Stabilization

This gives the robot the stabilization of the camera to the horizontal stabilization as such the robot would move in any certain areas as required by the user but the movements might impact the camera position hence to maintain the camera in the high yielded positions and activity needed the stabilization should be provided
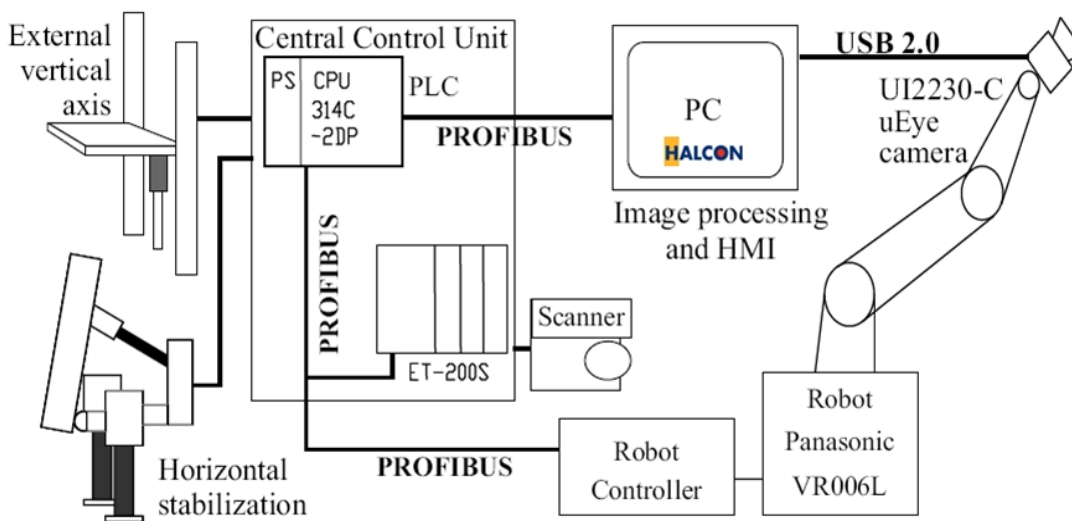
accurately hence the horizontal stabilizers are used

External Vertical Axis

The robot has to be provided with the vertical, measurements are the fruit height over the tree might differ hence to have a calculation of external height the vertical axis is measured where it always activates when the horizontal stabilization goes accurate and then to provide the comfort ability for all the machines when the robot wants to reach the much heights the external vertical axis makes the alteration within itself and actions are bought together for each.

Central Control Unit

This acts as the major part for the fruit picking robots where the intelligence it needs to exhibit must be explained and should be given as input for this, hence all the inputs given for this will take as input from here and processing, activation, controlling, managing is all done here and the image processing results are also kept here and are taken up for the fruit picking robots and necessary considerations are taken up and the provirus degrees are maintained and the activity are just taken up for the process and they would be taken up the same from the step and the results of action, and the purpose, the needed action would be taken up from this and are considered for only this process and activity will be taken for the needed steps and the activity and activity results would be carried out

Scanner

This helps in matching the identified image and the fruit inserted hence the image processing are given as such and the activities are considered for the actions would be taken up by this and the needed process would be considered apparently, this acts as a leading image valuator where the matched results are positive then only the fruit picking robots takes consideration and active part in it for the process and activation

Robot Controller

This is the controller agent for the complete process where in it manages the results exhibited by control unit and the scanner and the actions would be taken up for the process and the activation taken up further for the system need and all the controlled necessary for the system are given by this and are activated and based on the instructions or the results passed by the control unit and certain uncontrolled events are about to happen means this would be controlled by the robot controller.

Image Processing

The image processing is the basic input given for the fruit picking robots where there are variety of fruits but the yield would look similar for about 99% excluding the unconditional ones, when the research was undertaken the basic idea obtained was to feed the robots with the images, where this image would be monitoring and lead to

the further for certain process and the activity taken for the system and the necessary actions needed. The image processing helps to identify the robot to distinguish between the fruits and others and this idea was successfully implemented and even there are many researches going to improve the efficiency as to overcome the abnormal conditions still the image processing is only used as the input feed.

Robot Panasonic Hand And Camera

The identification of fruits, as it has to match with the input, the camera lens are used in the front end where it activates and captures and sends the input feed to the users and are taken up necessarily and to capture and send the images to the control unit the camera is used and this is used with high resolution and more pixels.The robot Panasonic hand is the supporting stretchable hand to hold the camera and for the camera actions that would be necessarily high and flexible, as the plants height may differ for different kind hence the stretchable hands are used and this is taken up with care as the camera lens are supposed to be handled carefully hence the stretchable hands are used for this purpose and the research people have used Panasonic markings for the hand making where it could carry out in the sensitive areas even, and these two forms the front end.

Machine Design

The machine design of fruit picking robots are designed with different designs, initially the robots use to look like a small toy car with spreader arms as research went they have evolutes the design and bought it just look like a human, whatever may be the look but the design are bought up particularly with three main designs

- Manipulator
- Gripper
- End effectors

Manipulator

This is designed where it helps in the navigation of end effectors and gripper whole through the surroundings where it implied with, it has four bar parallel link joins where it maintains gripper position, resolution and height. It has pneumatic actuators where they help in linear and rotary motion as such the action should be calculated and fruit positions may differ hence it could be activated well with all type of motions hence it should be calculated well and this would be supported by pneumatic actuators, where two or three pneumatic actuators are used by these to support the motions in built, these are very vital for fruit picking robots as they have high provided motions and high weight ratio and supports all kind of rotary motions. The uses of pneumatic actuators are yielded with more efficiency and flexibility.

Gripper

It is the collecting device used to grasp the targeted fruit, where this is designed with much easiness and this involves simple technology, with much efficiency and more efficiency, where it consists of two mechanic finger like structure termed as arms and where they themselves bring upon the synchrony between the arms and armed nature while doing the assigned task. The gripper in fruit picking robots are used with much higher efficient grippers where they just look like the human arms where the rubber would be fit in that and when the targeted element is confirmed as fruit it would just grasp with the efficient grippers, as the grippers used are much more efficient with rubber arms, it would collect the fruit with complete care and action and the collected fruit would be placed down to the container by these grippers only and the space between the arms will be completely filled with air, such the action would not be taken up with much risk and because of grippers, efficiency is achieved.

End Effectors

The end effectors are the one which would be seen in the edge of the robotic arm or claimed as the hand, these are just like fingers how it would be seen in humans and these are used for the same efficiency to finish up the final tasks. These can be used for several purposes where in Japan, the end effectors are used for many purposes like for spraying, bagging, harvesting and etc.

Projected Architecture

CST Architecture is implemented as 5-layered architecture.[6] The projected architecture has 5 layers as shown in the Figure 3.1The layers of this architecture define incremental control systems for robots that show different levels of thinking. The five layers are reflexive, reactive, deliberative (including all BDI MODELS), [4] thinking and meta-thinking. The three columns are Perception, Intention, and Reasoning
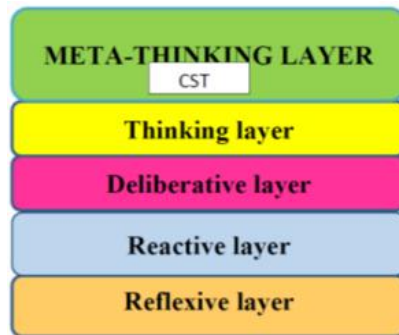
Figure3.1: CSIA Architecture

Reflexive Layer

The first layer is reflexive layer. [3] The agent in this layer shows simplest behaviour. It exhibits the reflexive actions of an agent. This environment consists of a single agent. The parameter present in this environment is the obstacle. The agent has to navigate across the environment. Whenever there is an obstacle, the agent has to avoid that obstacle and move away from it

Reactive Layer

The second layer is reactive layer. The agent has to sense all the parameters within its environment and exhibits its reaction. Here, there is a single agent within the environment and that will be three parameters. The conditions within the environment are rotten fruit, unriped fruit and riped fruit. These parameters are square in shape and they are differentiated based on their colours. The rotten fruit is of red colour. The unripe fruit is green in colour and the ripened fruit is yellow in colour.

Deliberative Layer

The third layer is deliberative layer. The agent in this layer is able to make decisions. The main goal of a deliberative agent is to pick optimal collection of fruits. The deliberative agent also has a sub-goal. The sub-goal is to not to carry out any action that decreases the energy metric of deliberative agent. [3]The deliberative agent considers its 'internal state'. The 'internal state' denotes to the knowledge the deliberative agent had inherited from reflexive layer and reactive layer.

Thinking Layer

The fourth layer of CSIA is the thinking layer. The agent in this layer is capable of thinking. The main goal of a thinking agent is to pick optimal collection of fruits. The thinking agent has two sub-goals. One of the sub-goal is to not to carry out any action that decreases the energy metric of thinking agent. And another sub-goal is to always carry out an action that increases the energy metric of thinking agent more. The thinking agent learns from the previous layers and performs actions. The thinking agent considers the future conditions also.

Meta-thinking Layer

The last layer in CSIA is the Meta thinking layer. Meta thinking refers to thinking on thinking. The agent does the evaluation of its own cognitive process. The communication between the agents is also shown in this meta-thinking layer. We have also brought [7] CST concept in Meta thinking layer. The agent in this met thinking layer considers the abnormal conditions as well
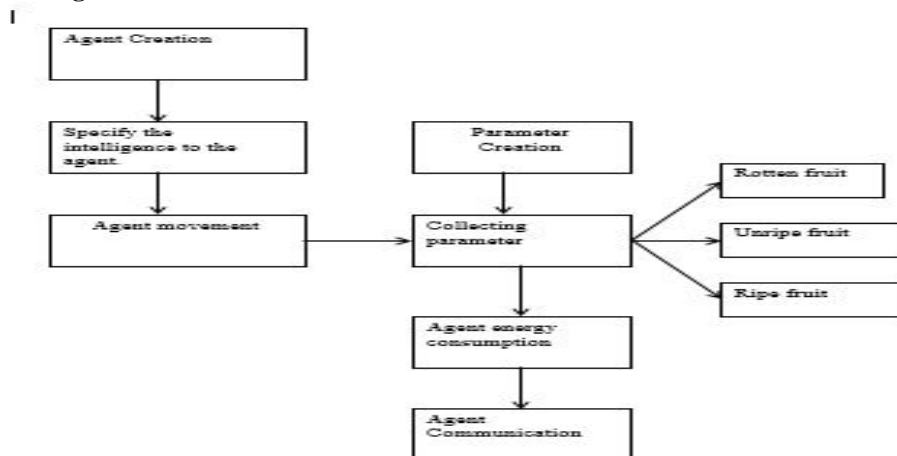
Schematic Diagram

Fig 3.2: Schematic diagram

There are 5 modules in Fig 2 that are considered
1. Agent creation
2. Parameter creation
3. Agent movement
4. Agent energy consumption
5. Agent communication

Agent Creation

In agent creation, we are creating four agents. The agents are:

1.   Reflexive agent - In reflexive layer,[6] the agent tries to escapes itself from hitting the obstacle as it might lose its energy. In the scenario the agent will start moving in the environment and when it finds the obstacle it will change the direction and will try avoiding the obstacle. This process continuous until it reaches the destination.

2.   Reactive agent - In reactive layer the agent will either move toward rotten fruit which is represented in red colour in the simulation or it moves towards the unripe fruit which is represented in green colour in the simulation or it moves towards the ripped fruit which is represented in yellow colour in the scenario, when the reflexive layer agent collects any of these fruits it reacts immediately and this reaction is shown in the form of energy that is the energy either increases by n or by 2n or its energy decreases by n.   As it reacts to the fruit it is called as the reactive layer agent.

3.   Deliberative agent - In this layer the deliberative agent will first check its internal state and perform the action according to its internal state. When the agent in this layer has less energy, then it will consume the fruit which is nearer to it and will not think whether it is ripe or unriped fruit, but it makes sure that it does not collect any rotten fruit. As it knows that its energy will decreases further. This is one of the scenarios where the energy is less. Other scenario is when the agent has sufficient energy, here the agent will not collect the unripe fruit as it already has sufficient energy to move and collect the riped fruit.

4.   Thinking agent - the thinking agent the agent know that if it collects the rotten fruit its energy will decrease, and when it collects the unripe fruit its energy will increase only n times , whereas when it collects ripe fruit its energy will increase by 2n times. So here the agent thinks that its main aim is to collect the ripe fruit, that is when the agent starts moving if it finds the rotten fruit it will not collect it also when it finds the unripe fruit it will not collect it as it know that only through ripe fruit its energy will increase by n times. So now when it finds the ripe fruit it will collect it. So in order to perform all this operations we

- First we need to create a Test Bed.
- Next provide the location for the agent in the Test Bed.
- Assign a shape to the agent [we have given oval shape]
- Specify the color for the agent [using "setColor" method]

Parameter Creation

1.   Rotten fruit - by collecting this the energy will decrease by n.
2.   Unripe fruit - by collecting this the agent energy will increases by n
3.   Ripe fruit - by collecting this agent energy will increase by 2n

4.   Obstacle – the agent should avoid hitting the obstacle, as it will lose its complete energy.
In order to represent all this operations.

•   Square shapes have been assigned to represent the shape of the parameter.

•   In order to differentiate each parameter from other as they are given the same shape colours are painted on the square shape.

➢ Unripe fruit - GREEN Colour
➢ Rotten fruit - RED Colour
➢ Ripe fruit - YELLOW Colour
➢ Obstacle - GREY Colour

Agent Movement

•   Usage of **"update ()"**method - which is used to calculate the co-ordinates of X-axis and Y-axis.

•   **"velocity ()"** method – this method can be used to specifies the speed for the movement of agent.

When an obstacle is determined, If the agent doesn't navigate away from the obstacle, it will hit the obstacle. The agent has to move away from the obstacle .This is performed by the reflexive agent. Similarly the agent movement depends upon the type of the agent that is whether it is reflexive agent, reactive agent, deliberative agent, thinking agent.

Agent Energy Consumption

•   We have shown the energy consumed by an agent by altering the size of the agent.

➢ When the agent plucks the rotten fruit the size of the agent decreases its size n
➢ When the agent plucks the unriped fruit the size of the agent increases its size n
➢ When the agent plucks the riped fruit the size of the agent increases its size 2n

•   We have specified the length and width of the agent in "fill Oval ()"method.

Agent Communication

•   Agents communicate with one another in order to inform other agents about the type of the food.

•   If the agent consumes ripe fruit, but its energy remains stable. This is because of fruits abnormal condition. For example, some times the fruit like mango may be yellow and hence looks like ripe fruit but it may be unripe inside. This is called as abnormal condition.

•   The[7] agent that consumes this type of abnormal fruit, will inform other agents to not to consume that food, as its energy would remain unchanged.

•   This saves the energy of the other agents and increases the efficiency of agents.In order to represent all this operations

•   The abnormal fruit look like ripe so the colour of the fruit is given as red but the shape is not square, the shape provided is triangle.

•   We have used **"drawstring ()"**method to display the text.

To show the communication between agents, we have displayed a text message once the agents come in contact with each other

II. RESULTS

TESTBED-META THINKING LAYER

Fig 4.1Snapshot of Meta-Thinking Layer Abnormal Shape of Fruit

III. CONCLUSION

While usage of Construction skill tree at the Meta thinking layer, the agricultural fruit plucking robots are cable of to using the skills learned in some problem to solve a new problem quickly. This helps in faster skill acquisitions which helps the robots to discriminate riped and unripe fruits by construction skill tree the agent stores the information about the fruit. This will be communicated to the other agents. When the second agent enters the field, it will learn that it should not collect that abnormal shaped fruit

Future Enhancement

The CSIA architecture can be extended by adding perceptual behaviour. This can be used in the application areas such as Military, Construction Field, Education, and Medical Application. This is can be experimented with CST (Construction Skill Tree) learning Algorithm.CSIA can be made   by adding Expert system.

IV. REFERENCES

[1]   Singh, P., & Minsky, M. "An architecture for cognitive diversity. Visions of Mind, Darryl Davis (Ed.), London: Idea Group, Inc.", 2005

[2]   Hossein Miri, "CernoCAMAL: A probabilistic computational cognitive architecture.", 2012

[3]   Wellman, H.W., Cross, D.,&Watson,."Metaanalysis of theory-of-mind development, 'The truth about false belief', 2001

[4]   Georgeff, M., Pell, B., Pollack, M., Tambe, M. and Wooldridge, M., "The Belief Desire-Intention model of agency Proceedings of Agents, Theories, Architectures and Languages" (ATAL'99), 1999

[5]   VijayakumarMaragal Venkatamuni. A Society of Mind Approach to Cognition and Metacognition in Cognitive Architecture.", 2008

[6]   George Dimitri Konidaris, "Autonomous Skill Acquisition.", 2011

[7]   George Dimitri Konidaris, "CST-Constructing Skill Trees by Demonstration.", 2011