Artificial Intelligence in Power Saving & Games

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Abstract - *Intelligent machines will replace human capabilities in the future, in many areas. Artificial intelligence is the machines or software's intelligence. It is the field of computer science. Artificial Intelligence is a popular field as it has enhanced our life in many areas. Artificial intelligence in the previous 20 years have improved performance greatly in field of the service systems and manufacturing. Artificial intelligence have gave rise to the technology known as expert system. Artificial Intelligence is having a huge impact on various fields of life as expert system. It is widely used to solve the complex problems in various areas as business, science, medicine, weather forecasting and engineering. This paper gives an overview of this technology and the application areas of this technology. We will see techniques of Artificial Intelligence like Neural Network and Fuzzy Logic and their implementations. In this paper we will also see the use of Artificial Intelligence in various technologies as the area of interest in Artificial Intelligence, Power management using Artificial Intelligence and use of Artificial Intelligence in the computer games with NPC(Non Playing Character)*

Key Words: **Artificial Intelligence, Fuzzy Logic, Neural Networks (computer), NPC(Non Playing Character), Power Systems.**

1. INTRODUCTION

Artificial Intelligence is the hottest topic these days. It is mainly about the intelligence of the machines. With Artificial Intelligence the machine are more in learning on their own rather than giving them set instructions and they following it being dumb. It makes them more comfortable as a human companion. I hope everybody have seen Jarvis in 'The Iron Man' movie series, who would not love to have such assistant being with them for them 24x7. These things are no longer a dream now, they becoming reality now-a-days. With assistants like siri from apple's ios, cortana from Microsoft windows, Google assistant from Google, etc. and etc. All these are possible due huge advancement in Artificial Intelligence.

In this paper we will focus development of Artificial Intelligence major concepts of rather than giving them set instructions and they following it being dumb. It makes them more comfortable as a human companion. I hope everybody have seen Jarvis in 'The Iron Man' movie series, who would not love to have such assistant being with them for them 24x7. These things are no longer a dream now, they becoming reality now-a-days. With assistants like siri from apple's ios, cortana from Microsoft windows, Google

assistant from Google, etc and etc. All these are possible due huge advancement in Artificial Intelligence.

In this paper we will focus development of Artificial Intelligence major concepts of helps us dealing with uncertainties. We will dig into many details for these topics with some examples how they enhance the abilities of Artificial Intelligence. Also we will find out in which possible areas we implement Artificial Intelligence in near coming future.

Artificial intelligence is less expensive and more like consistent and permanent thing, and therefore more importance and gives it more advantage over other natural intelligence. Artificial intelligence can perform some work better and faster than men, they can be easily dissemination and duplicated.

The Turing Approach Test: In the year of 1950 Alan Turing proposed a test named test "Turing" which is named after him. It was designed to check if a machine is capable of thinking or not. Their human interrogator who interacts with a machine and with human and it has to tell which one is machine and who is machine. After giving some questions if an interrogator, cannot tell difference whether the written response is coming from the machine or from human, the test is passed by computer.
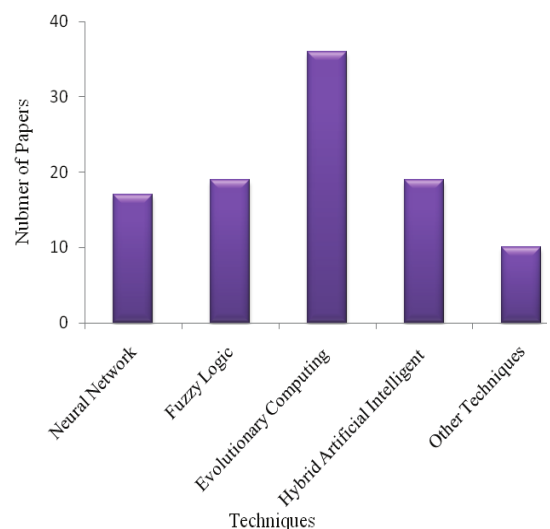

Chart -1: Papers on AI Techniques
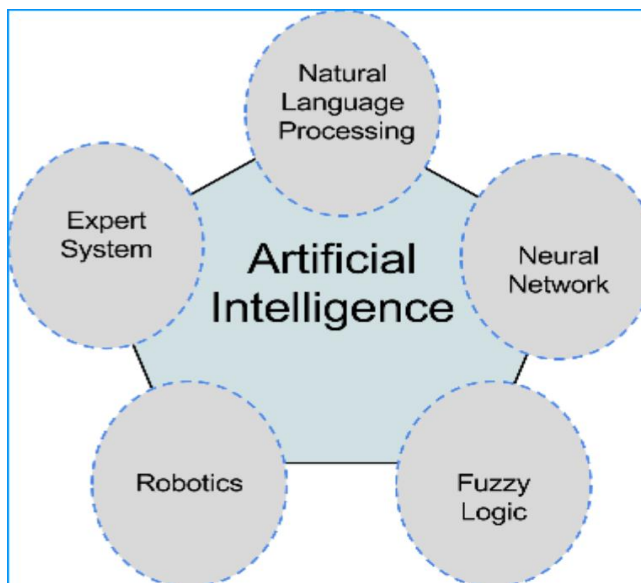
2. Research Areas of AI

Fig -1: Research Areas of AI

Artificial Intelligence research area had many areas to do research. Above diagram shows some common areas.

1. Natural Language Processing:-

It's the process of understanding and responding to the natural language. Also translating spoken to written language and one natural language to other natural language.

2. Experts System:-

Expert's systems are domain specific and created by high - knowledge and intelligent people. So user who may use this system may not be that much skilled but can use the system.

3. Neural Network:-

Dr. Robert Hecht-Nielsen defines a neural network as –A computing system made up of a number of simple, highly interconnected processing elements, which process information by their dynamic state response to external inputs.

4. Robotics:-

It's domain in Artificial Intelligence to create robots which work on real world.

5. Fuzzy Logic:-

It's involves all intermediate possibilities between digital values 0 and 1

2.1 Application of Artificial Intelligent Techniques in Saving Home Electricity

Now a day we require lots of electricity at our home for so much of electronics thing like AC, FANS and LIGHTS etc. Some of the time what happens no one in the home and all the electronic things are on so we can create a system which can control the electricity.

The basic function of this controller is sense the movement of the persons in the home and on the movement it can on-off or speed up or speed down the electronic system. We use Fuzzy logic in this which can give more possibilities of input and output results.

Hence when there is no one at home and if electronic device are on the can get off automatically.
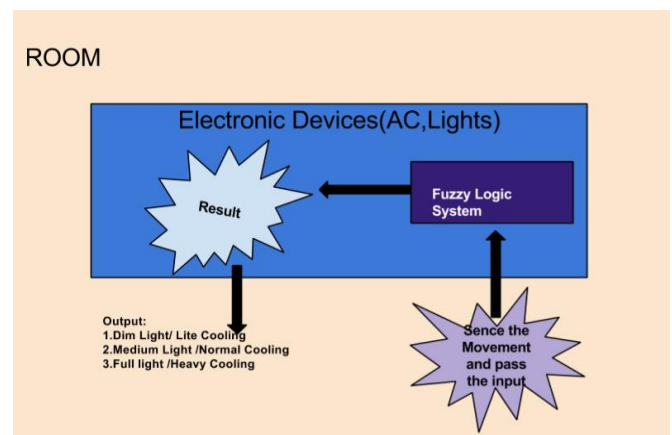

Fig -2: Fuzzy Logic System

Hence when there is no one at home and if electronic device are switched on then they can get off automatically as well as we will connect this entire thing with network so that handling and getting status of all this electronic devices from anywhere is easy. Same can also apply on the Offices, Big Hotel and Restaurants for handling the Light and A.C's

3. Methodology

3.1. Sensors Use

We will use Passive Infrared (PIR) Sensors. These are the electronic sensors that measure the infrared (IR) light radiating from objects in its field of view. Always use in the PIR based motion detector. [8]

These sensors measure the heat of the object as well as detect the motion of moving object. This type of sensors senses only infrared rather emitting it.

Fig -3: Motion Detector (PID).

3.2. Controller System

Setup:-

As shown in the diagram, we can install the sensors on the main entry points of the room or hall so that we can get the exact movement or count of the living objects are there or not if their the how many are they?
When there are too many persons in the room then this PIR sensors sense the movement rigorously and update the system records for particular room.
If for particular time we can't find the movement from object then after 5 min the power saver process will be started and firstly dim the lights or slow down the Air Conditioner's.

Fig -4: Normal House with Install Sensors

When we got the approximate values of the movements or availability of the person on that from system particular action will be called.

For automated system call we have to make the central processing system which control all the requests and responses. We will save all the sense information in the memory which store in the network server as well as all the sensors and the electronic devices switches also connected with network resources.

For handling all this resources we can also create an App which can handle all the devices and it will also find the electricity and device working status.

Calculations:-

Fuzzification is the process of transforming crisp values in the linguistic values like for example (Warm, Hot, Freezing).On these linguistic value decision is going to take.

Defuzzification method uses certain method to convert the Fuzzy sets to crisp sets .Like Max-Membership method, Centroid method and weighted average method.
In our case we use Max Membership principle also known as Height Method.
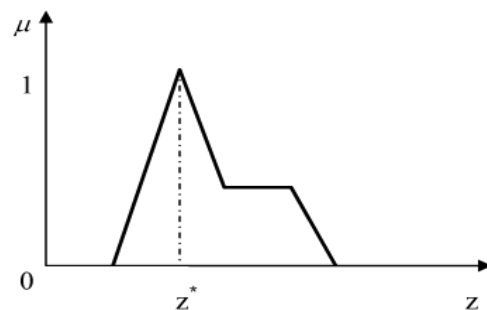

Figure 5. Max membership defuzzification method.

From all the inputs from the electronics devices we get the defuzzified value on which the next decision is take what should be done.
So For particular home we have the no.'s of input from every room then we can have the constant flow of Air Conditioner for that particular value.

Example:-
Hall:3-4 movements/min
Room:6-10 movements/min

So we have fuzzy sets with value 0 to 10 onto which we can decide what type of flow should be carried forward.
From Max Membership Principle Method value for Hall and room will be 4 and 10 so defuzzified value when converted to crisp sets value will be 0 and 1 and A.C flow for Hall will be low and for Hall it will be Normal.

Same we can do with the lights and FAN's and other electronic device also.
For Big Restaurants and Hotels this can be measures in the same way to manage the electricity.

Creating App Or Portal:-

For Handling all the thing we have to create on expert system because user who gone use it will be not having of any knowledge of the system. User only need the advantage

of the system so we will create app for this in which all the information it will show.

From the status of every device to handling the device. In the below diagram we can see the we can show how much electricity is in use, how much lights are on likewise.

Also what is the status of the particular device so device list are also available. In the same way we can also include if door is locked or not by adding other sensors.

For Home use it can be handling by the Mobile App but for the Hotel and restaurants we require portal which can handle this.

$$\mu C(Z^*) \geq \mu C(Z)$$
$$\text{for all } z \in Z$$
$$\text{where } z^* \text{ is defuzzified value.}$$

     When we creating app or portal it's important part is backend. Where all the data of app is stored .That data came from the devices so we need that system install in the home or hotel which all together connected to the network.

     When device senses the movement it pass that record to the local database.

Fig -6: Demo App image for Handling Home Appliances.[10]

Device	Electricity	Flow Type	Occupancy	Numbers	Switch
AC	8	Normal	Medium	2	ON
Lights	4	Normal	Medium	4	ON
FAN	4	Normal	Medium	1	ON

Table -1 Occupancy Table

4. Application of Artificial Intelligent Techniques in Computer Games

Playing game are most popular use of the computer technology .In the evolution of computer games, hey have been grown from two dimensional and modest text based game to the three dimensional graphical games with complex and large world. Systems uses Graphics, Audios, User Inputs and game artificial intelligence (AI) when they came all together provide the expected funny, entertaining and worthwhile game.

IF we remove the Artificial Intelligence from computer game it will be so simple and no one can play that game.
Computer Game Problems solved with AI:-

Non-playing character (NPC) movement, NPC decision making, and NPC learning.
Techniques used are path finding, Bayesian Networks, Fuzzy Logic, and Genetic Algorithms.

4.1. NPC Movement Using Path finding

Computer game must provide a way for an non playing character to move throughout the game world. For Example, When the player is on one side of the tree and the monster is on the other, through which path through the tree the monster will reach the player?

A* algorithm is the most widely used for path negotiation. It's very flexibility and also it determine the shortest path between two points. Typical A* algorithms have three main attributes like fitness, goal, and heuristic or F, G, and H respectively.

G -for cost to travel from the start node to some node between the goal.

H-estimated cost to get from the node to the goal

F- is the sum of g and h.
The A* algorithm also maintains an Open list of the nodes that have not been explored yet and a Closed list of nodes that have been explored.

The following is pseudo code for the A* algorithm [9].

1. Let P = the starting point.
2. Assign F, G, and H values to P.
3. Add P to the Open list. At this point P is the only node on the Open list.
4. Let B = the best node from the Open list (best node has the lowest f-value). a. If B is the goal node, then quit. A path has been found. b. If the Open list is empty, then quit. A path has been found.
5. Let C = a valid node connected to B. a. Assign F, G, and H values to C. b. Check whether C is on the Open and Closed list. i. If so, check whether the new path is more efficient (lower f-value). 1. If so, update path. ii. Else, add C to open list. c. Repeat step 5 for all valid children of B.
6. Move B from the Open list to the closed list and repeat From step 4.[9]

4.2. NPC Decision Making Using Bayesian Networks.

In the previous example of the monster negotiating a path to the player, a different problem must be solved first before negotiating the path. The problem is does the monster even know the player is present in the building? If the game designers give the full information of the game world to the non-playing character then there would be no fun in playing the game. This is an example of NPC Decision making. In this

AI is needed to make the non-playing character to act in a human like way. When the player enters the building from the other side, the monster will be unaware of the presence of the player because of the wall between them. If the player enters causing a noise disturbance, then the monster will sense the player and will start negotiating the shortest path as discussed in the NPC movement using path finding. One AI technique that is used to implement this is a Bayesian Network. It helps NPC to perform complex reasoning in a human like fashion. In this the computer calculates the probability of the monster sensing the player if the player has entered the building.

This expression can be written as;

$$P(B|A) = P(B|A) P(A) / P(B) [2] \text{ Where } P(B|A)$$

Is the probability that the monster would sense the player if the player had actually tripped. And P (A) is the probability of the monster sensing the player. And P (B) is the probability of the player tripping [2].

4.2. NPC Learning

Computer games use genetic algorithms to implement in the NPC's

A genetic algorithm works in the following way [7]

1. First generation population of random Organisms will be created.
2. Test on the Problem. Rank them in fitness accordingly. IF found best organism for performance goal then stop.
3. Select the best performers and mate them with genetic operator like crossover or mutation. Randomly add few brand new organisms to population for getting new variety and help to ensure against convergence on a local maximum.
4. Loop to step 2.
Genetic Algorithms creates the perfect specimen and are very complex.

5. RESULTS

We have discussed about the Artificial intelligence, also some of areas of application. We have studied its implementation in maintaining the proper consumption in households. We found out that it will be a lot helpful for saving the power in large amount. Secondly we saw how we can use it in computer games. It was used some puzzle games, and it worked out quite well. We can found it could be used to develop more challenging games in future.

6. CONCLUSIONS

Artificial intelligence is the field that gives machines the ability to think analytically by making use of concepts. From the last 2 decades Artificial Intelligence techniques have made tremendous contribution to the various areas.

Artificial Intelligence is continuously playing an important role in the various fields. This paper is based on the Artificial intelligence and its concepts, artificial intelligence areas of interest and system damping of oscillation and provide high quality performance and stability in the field of Power System Stabilizers (PSS) using Artificial intelligence, to protect the network from intruders in the Network Intrusion Detection, for medical image classification in the medical area in the field of medicine, in databases accounting, and how these Artificial intelligence techniques are used in computer games to provide features and to solve the common problems, so as to have fun. Analysis of Network Intrusion Detection is bright future using Artificial intelligence and let's not forgets the area of Power System Stabilizers there is also definite future in it. We thus now conclude that the further research in this Artificial intelligence can be and should be done as there are very profitable and promising results that can be obtained from such techniques. Scientists are yet to explore the full ability and potential of artificial intelligence. This technology and its applications will be reaching far effects on human life in the time to come. But we may also have to take some precautions in our security as that may lead to something which could be out of human control.

6. Future Scope

There's still many more to come in this field. Every people and big companies are taking keen interest in the advancement in the field of Artificial intelligence. Also budgets for Artificial intelligence are being raised every year. So for now all we can say "*the sky is the limit*" still many more to come.
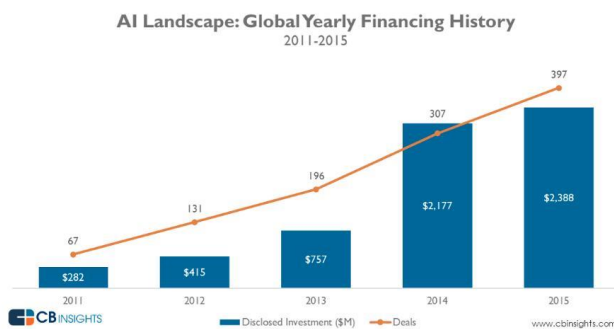

Fig -7: Financing Increment for AI

ACKNOWLEDGEMENT

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