International Journal of advancement in electronics and computer engineering (IJAECE)
*Volume 1, Issue 4, July 2012, pp.103-107, **ISSN 2278 -1412***

Investigating and Diagnostics with Intelligent Agents in Unknown Computable Environments

Sushil Kumar Singh[1] , Kalpana Rai[2]

[1]*M-Tech Scholar, NIIST, RGTU, sksingh2808@gmail.com,Bhopal (M.P) India*
[2]*Assistant Professor, Department of CSE, NIIST, RGTU, kalpana.rai123@gmail.com, Bhopal (M.P) India;*

Abstract – *The Paper concerns with the optimal behavior of agents in unknown computable environments, also known as universal artificial intelligence. These theoretical agents are able to learn to perform optimally in many types of environments. It is easy to work properly for an agent with known environment. If we sent this agent in unknown environment then will it work properly or not? Here I'll try to build such an intelligent autonomous body which will try to give the proper response for unknown environment. This autonomous body (i.e. intelligent agent) will learn by itself for the unknown environment and will take appropriate action to that environment. Although they are able to optimally use prior information about the environment if it is available, in many cases they also learn to perform optimally in the absence of such information. Moreover, these agents can be proven to upper bound the performance of general purpose computable agents. Clearly such agents are extremely powerful and general, hence the name universal artificial intelligence. Here I'll use the Hidden Markov Model (HMM) for observations for the various internal states.*

Keywords*: HMM , FIS , Intelligent Agents.*

I. Introduction

This Paper concerns with the investigation with intelligent agents in unknown computable environments. How these agents able to learn in the new environments? It is also concern to make an agent more intelligent i.e. the working of agents just like the best human brain. Such an agent is generally called as a Super Intelligent agent. A super intelligence is an intellect that vastly outperforms the best human brain in practically every field, including scientific creativity, general wisdom, and social skills.

The foundations of universal intelligence date back to the origins of philosophy and inductive Inference. Universal artificial intelligence proper started with the work of Ray J. Solomonoff in the 1960's. Solomonoff was considering the problem of predicting binary sequences. What he discovered was a formulation for an inductive inference system that can be proven to very rapidly learn to optimally predict any sequence that has a computable probability distribution. Not only is this theory astonishingly powerful, it also brings together and elegantly formalizes key philosophical principles behind inductive inference. Furthermore, by considering special cases of Solomonoff's model, one can recover well known statistical principles such as maximum likelihood, minimum description length and maximum entropy. This makes Solomonoff's model a kind of grand unified theory of inductive inference. Indeed, if it were not for its in computability, the problem of induction might be considered solved. Whatever practical concerns one may have about Solomonoff's model, most would agree that it is nonetheless a beautiful blend of mathematics and philosophy.

II. Literature Survey

The science of Artificial Intelligence (AI) might be defined as the construction of intelligent systems and their analysis. A natural definition of systems is anything that has an input and an output stream. Intelligence is more complicated. It can have many faces like creativity, solving problems, pattern recognition, classification, learning, induction, deduction, building analogies, optimization, surviving in an environment, language processing, knowledge and many more. A formal definition incorporating every aspect of intelligence, however, seems difficult. Further, intelligence is graded; there is a smooth transition between systems, which everyone would agree to be not intelligent and truly intelligent systems.

In artificial intelligence research, agent-based systems technology has been hailed as a new paradigm for conceptualizing, designing, and implementing software systems. Agents are sophisticated computer programs that act autonomously on behalf of their users, across open and distributed environments, to solve a growing number of complex problems. Increasingly, however, applications require multiple agents that can work together. A multi-agent system (MAS) is a loosely coupled network of software agents that interact to solve problems that is beyond the individual capacities or knowledge of each problem solver.

III. Structure of Intelligent Agent

An agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through effectors. A human agent has eyes, ears, and other organs for sensors, and hands, legs, mouth, and other body parts for effectors. A robotic agent substitutes cameras and infrared range finders for the sensors and various Motors for the effectors. A software agent has encoded bit strings as its percepts and actions.

An intelligent agent is software that assists people and act on their behalf. Intelligent agents work by allowing people to delegate work that they could have done, to the agent software. Agents can perform repetitive tasks, remember things you forgot, intelligently summarize complex data, learn from you and even make recommendations to you. The fig. 1 shows the agent with the interaction with environment.

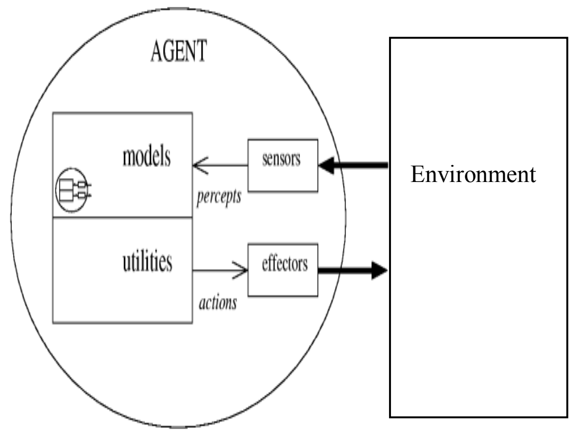

Fig.1. Agents interact with environments through sensors and effectors

To understand how intelligent agents work, it is best to examine some of the practical problems that intelligent agent can help solve. An intelligent agent can help you find and filter information when you are looking at corporate data or surfing the Internet and don't know where the right information is. It could also customize information to your preferences, thus saving you time of handling it as more and more new information arrived each day on the Internet.

An agent is anything that can be viewed as perceiving its environment through sensors and acting on that environment through effectors. What we are concerned with is the match between agent properties (i.e., what an agent can perceive, how it can act, and what it supposed to achieve) and environment properties.

A simple agent program can be defined mathematically as an agent function which maps every possible precepts sequence to a possible action the agent can perform or to a coefficient, feedback element, function or constant that affects eventual actions:

$$f : P^* \rightarrow A$$

Agent function is an abstract concept as it could incorporate various principles of decision making like calculation of utility of individual options, deduction over logic rules, fuzzy logic, etc. The program agent, instead, maps every possible percept to an action.

We use the term percept to refer to the agent's perception inputs at any given instant. In the following figures an agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through actuators.

Basically the structure of intelligent agent consist the following:

- Agent Type
- Percepts
- Actions
- Goals
- Environment

The example of intelligent agent is shown below:
Agent: Intelligent house

Percepts: signals from temperature sensor, movement sensor, clock, sound sensor

Actions: Room heaters on/off, lights on/off

Goals: Occupants warm, rooms light when occupied, house energy efficient

Environment: At various times, occupants enter and leave house, enter and leave rooms; daily variation in outside light and temperature.

So far we have talked about agents by describing their behavior—the action that is performed after any given sequence of percepts. Now, we will have to bite the bullet and talk about how the insides work. The job of AI is to design the agent program: a function that implements the agent mapping from percepts to actions. We assume this program will run on some sort of computing device, which we will call the architecture. Obviously, the program we choose has to be one that the architecture will accept and run. The architecture might be a plain computer, or it might include special-purpose hardware for certain tasks, such as processing camera images or filtering audio input. It might also include software that provides a degree of insulation between the raw computer and the agent program, so that we can program at a higher level. In general, the architecture makes the percepts from the sensors available to the program, runs the program, and feeds the program's action choices to the effectors as they are generated. The relationship among agents, architectures, and programs can be summed up as follows:

agent = architecture + program

IV. Characteristics of Intelligent Agent

All agents are autonomous, which means that an agent has control over its own actions. All agents are also goal-driven. Agents have a purpose and act accordance with that purpose. There are several ways of making goals known to an agent, and are listed below:

- An agent could be driven by a script with pre-defines action which would then define the agent's goals.
- An agent could also be a program and as long as the program is driven by goals and has other characteristics of agents.
- An agent could also be driven by rules, and the rules would define the agent's goals.
- There are also embedded agent goals, such as "planning" methodologies, and in some cases the agent could change its own goals over time.

An agent could also senses changes in its environment and responds to these changes. This characteristic of the agent is at the core of delegation and automation. For example, you tell your assistant "when x happens, do y" and the agent is always waiting for x to happen. An agent continue to work even when the user is gone, which means that an agent could run on a server, but in some cases, an agent run on the user systems.

In a Multi-Agent System, agents are social, this means that they communicate with other agents.

Some agents learn or change their behavior base on their previous experiences. Some agents are mobile, meaning they move from machine to machine to be closer to data they may need to process and do so without network delays. Finally, some agents attempt to be believable, such that they are represented as an entity visible or audible to the user and may even have aspects of emotion or personality.

In artificial intelligence, there are several categories of problems, one of which is machine learning. The goal of machine learning is not quite the search for consciousness that seems so exciting, but in some ways it comes closest to reaching for what may seem to be the traditional goals of AI. Machine learning is about just that: designing algorithms that allow a computer to learn. Learning, of course, doesn't necessarily imply consciousness. Rather, learning is a matter of finding statistical regularities or other patterns in the data. Thus, many machine learning algorithms will hardly resemble how you yourself might approach a learning task. Nevertheless, learning algorithms can give insight into the relative difficulty of learning in different environments. Learning, like intelligence, covers such a broad range of processes that it is difficult to define precisely. A dictionary definition includes phrases such as to gain knowledge, or understanding of, or skill in, by study, instruction, or experience," and modification of a behavioral tendency by experience." Zoologists and psychologists study learning in animals and humans. In this book we focus on learning in machines. There are several parallels between animal and machine learning. Certainly, many techniques in machine learning derive from the efforts of psychologists to make more precise their theories of animal and human learning through computational models. It seems likely also that the concepts and techniques being explored by researchers in machine learning may illuminate certain aspects of biological learning.

V. Proposed Method

My approach will consist the following terms:

- Behavior of intelligent agents in unknown computable environments.

- Designing the internal states using Hidden Markov Model (HMM).

Agent learning in new environment will consist the unsupervised and reinforcement learning method.

- Fuzzy Inference System (FIS) will be used for determining the actual performance task.
- I'll use the Matlab software for result analysis.

The algorithm for the overall process is as follows:

If there is the general (known) task for the agent then it will perform the action through actuators directly.

Otherwise do the following steps:

- Modeled all sensors generated states Si in the form of Hidden Markov Model (HMM). It will generate the set of observations Oi.
- Apply the set of observations as a set of input parameter Xi for the learning phase. It will generate the set of output parameter Yi.
- The set of learning output parameter will then pass to the Fuzzy Inference System (FIS). It will generate the actual performing task.
- Then through the actuators the appropriate action is performed to the environment.

VI. Conclusion

Mostly intelligent agents work properly which are designed for the known environment. The inbuilt functions are designed for these agents, on the basis they work. Although the intelligent agents are the autonomous body which work on behalf of man. Suppose we design an intelligent agent for the earth and it contain the features which will proper work for earth. And sudden we send it at the other space then how it will react? Imagine! Will it work properly or not?

So here, I try to build such an intelligent agent which will work for unknown computable environment. If it will success then it may solve many complex problems.

Same concepts we can apply for the autonomous taxi driver. This autonomous taxi will work for different countries where each country has their own rules for driving i. e. the unknown environments for the taxi. Then this taxi will self learn for unknown environment and then it will take the appropriate action for performing the task.

References

[1]Stuart Russell and Peter Norvig, Artificial Intelligence to Modern Approach, *Prentice artificial Hall series in intelligence*, Chapter Intelligent Agent, pages. 31-52.

[2]A. Alanis, Architectures for Systems Multi-Agentes, (*Master Degree thesis in computer sciences)*, Tijuana Institute of Technology, November, 1996.

[3]Michael J. Woodridge, Nicholas R. Jennings.(Eds.), Intelligence Agents, Artificial Lecture Notesin 890 Subseries of Lectures Notes in ComputerScience, Amsterdam, Ecai-94 *Workshop on Agent Theories*, Architectures, and languages, The Netherland, August 1994 Proceedings, ed. Springer-Verlag, págs. 2-21.

[4]P.R. Cohen ET , An Open Agent Architecture,working *Notes of the AAAI Spring symp*.: SoftwareAgent, AAAI Press, Cambridge, Mass., 1994 págs.1-8.

[5]Bratko I. Prolog for Programming *Artificial Intelligence, Reading*, Ma. Addison-Wesley, 1986.

[6]Or Etzioni, N. Lesh, and R. Segal,Bulding forSoftbots UNIX? (*preliminary report). Tech. Report*93-09-01. Univ. of Washington, Seattle, 1993

[7]Elaine Rich, Kevin Knight, *Artificial intelligence, Second Edition,* Ed. Mc Graw-Hill,págs. 476-478.

[8]Elaine Rich, Kevin Knight, *Artificial intelligence, Second.Edition*, Ed. Mc Graw-Hill,págs. 478-479.

[9]Arnulfo Alanis Garza , Juan José Serrano, Rafael Ors Carot, José Mario García Valdez, *journal Engineering Letters*. special issue, "Hybrid Intelligent System using Neural Networks, Fuzzy Logic, and Genetic Algotrithms.

Author's Profile

Mr.Sushil Kumar Singh*, has done his BE in CSE, from Anand Engineering College,Agra(UP). He is M.Tech scholar in Computer Science & Engineering department at NIIST,Bhopal affiliated to Rajiv Gandhi Technical University University, Bhopal, MP, India.*

Prof. Kalpana Rai *has done BE in Computer Technology in 2001 from Nagpur University. She has completed her M.Tech in Computer Science & Engineering from RGTU,Bhopal. She is having Teaching experience of 11 years.*
Presently She is working as Assistant Professor at NRI Institute of Information Science & Technology.,Bhopal, MP, India. Her working areas are Artificial Intelligence , Image Processing , Compiler Design etc.