Chapter 1

How the “what” becomes the “how”

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1.1 Abstract

Edward Albert Feigenbaum was awarded the ACM turing award in 1994 for pioneering the design and construction of large scale artificial intelligence systems, demonstrating the practical importance and potential commercial impact of artificial intelligence technology.

1.2 Introduction

E.A. Feigenbaum was highly inspired from Alan Turing idea of inventing a machine which is not just programmable but re programmable, which could not only do calculations but can also determine what to do next, he was convinced that machines can’t think as human do but a machine can be called intelligent if it can perform any required task. Turing designed a test called the imitation game(published in his paper Computing Machinery and Intelligence in 1950) in which a judge talks with an unknown being and based on the responses determines whether it is a robot or a human.

1.3 Summary

To achieve this goal a machine is to be fed with a large amount of data and also the machine should be made as it can learn further on it’s own while in use. For the precise and efficient working of computer the data fed should be domain specific. In 1956 Newel and Simon gave Logic Theory by which computer can be feed with a set of symbols and it will process them and later produce required result(called Physical Symbol System Hypothesis). But it was limited to solving complex calculus problems and couldn’t do any predictions or further processing. In the year 1958 program with common sense was developed in which McCarthy explained that common sense is not based on logic but it could be developed only with pre-acquired knowledge(like common sense of two humans can be different like for a businessman the term hostile takeover is common sense but for a farmer it is not).

1.4 The What-to-How Spectrum

The great 'What to How' relation it is a spectrum which explains the interface between humans and a machine. For a computer to be intelligent it should interact with humans, so there is a requirement of a interface which will understand human language (can be embedded with syntax), and should process it so that it is converted into machine understandable form (this can be achieved in steps). What and How are the two ends of this spectrum where what deals with interaction with humans 'what is the expected task to be done', and how is the final stage for conversion to machine understandable form of the program.

1.5 The KP Applies to the What-to-How Spectrum

AI exist at one extreme of a software spectrum that I call the "What-to-How" spectrum of all software. Assemblers and compilers were early steps. What were called at an early time "higher-level languages"—Fortran and Cobol being the most popular examples—were big winners because they allowed users to express somewhat more easily the algebraic formulas and data-processing procedures the users wanted the computer to do for them. AI programs were born at the What end of the spectrum. With these programs, users express their desires as goals—if not in full natural language then in the technical jargon of a specialty domain. Programs then use problem-solving processes and domain specific knowledge to work out the details of how those goals will ultimately be accomplished entirely procedurally by the computer at the How end of the spectrum. Just as compilers translate expressions into executable code, so AI programs translate user goals into executable solution sequences.

1.6 Importance of domain specification

An artificially intelligent computer can do predictions also for which a large amount of data along with specifications and exceptions should to be fed in it so that it can recognize patterns using references, also it should learn (add newly acquired knowledge to it's database on it's own)so for fast and precise working of such computer it should be domain specific(in real life also a person may be jack of all trades but can't be master of many).

1.7 Expert System

The word "expert" in expert system refers to the intention of the ES designer to have the system achieve a level of competence of problem solving in some domain of work that rivals the performance of human specialists (experts) in that domain. To accomplish this, the ES must be given the knowledge that such human experts have that distinguishes experts from novices and enables experts to perform well. To acquire and represent that knowledge is the job of the knowledge engineer. Increasingly, with the advance of ES development tools, experts are able to be their own knowledge engineers. ESs are almost always used as interactive intellectual aids for human decision makers, almost never as autonomous unsupervised agents. The knowledge base (KB) of the ES contains the up-to-date knowledge and the informal heuristic know-how of one or more experts in the domain. The knowledge in the KB is what differentiates these experts from novices, even though all. Most applications of the Artificial Intelligence (AI) science and technology are of a type called Expert

Systems. An Expert System (ES) is a computer program that reasons using knowledge to solve complex problems.

1.8 Major work done under AI till date

Sophia is a social humanoid robot developed by Hong Kong-based company Hanson Robotics. Sophia was activated on April 19, 201 and made her first public appearance at South by Southwest Festival (SXSW) in mid-March 2016 in Austin, Texas, United States. She is able to display more than 62 facial expressions. Cameras within her eyes combined with computer algorithms allow Sophia to see. She can follow faces, sustain eye contact, and recognize individuals. She is able to process speech and have conversations using Alphabet's Google Chrome voice recognition technology and other tools.

1.8.1 Artificial cognition for social Human–robot interaction: An implementation

Human–Robot Interaction Challenges Artificial Intelligence in many regards: dynamic, partially unknown environments that were not originally designed for robots; a broad variety of situations with rich semantics to understand and interpret; physical interactions with humans that requires fine, low-latency yet socially acceptable control strategies.

1.8.2 Robot ethics: Mapping the issues for a mechanized world

Robots are often tasked to perform the "three Ds", that is, jobs that are dull, dirty, or dangerous. For instance, automobile factory robots execute the same, repetitive assemblies over and over, with precision and without complaint; military surveillance UAVs patrol the skies for far more hours than a human pilot can endure at a time.

1.8.3 Integrating social power into the decision-making of cognitive agents

Agents with a model of cultural dimensions were used to develop an inter cultural training tool. and the application of social cognitive processes is a key factor in the development of virtual humans to train social skills, such as negotiation, interviewing and leadership.

1.8.4 Watson

A vision for applying the Watson technology to health care and describes the steps needed to adapt and improve performance in a new domain. Specifically, it elaborates upon a vision for an evidence-based clinical decision support system, based on the Deep QA technology, that affords exploration of a broad range of hypotheses and their associated evidence.

1.9 Future Projects Related to AI

1.9.1 Automation Transportation

Transportation has released definitions of different levels of automation, with Google's car classified as the first level down from full automation. Other transportation methods are closer to full automation, such as buses and trains.

1.9.2 Cyborg technology

AI will become useful for people with amputated limbs, as the brain will be able to communicate with a robotic limb to give the patient more control.

1.9.3 Solving climate change

Solving climate change might seem like a tall order from a robot but machines have more access to data than one person ever could—storing a mind-boggling number of statistics. Using big data, AI could one day identify trends and use that information to come up with solutions to the world's biggest problems.

1.9.4 Language learning

The hope is that techniques that have produced spectacular progress in voice and image recognition, among other areas, may also help computers parse and generate language more effectively.

1.9.5 Dueling neural networks

A research scientist at Open AI, generative adversarial networks, or GANs, are systems consisting of one network that generates new data after learning from a training set, and another that tries to discriminate between real and fake data. By working together, these networks can produce very realistic synthetic data. The approach could be used to generate video-game scenery, de-blur pix-elated video footage, or apply stylistic changes to computer-generated designs.

1.10 Conclusion

The vision of computational models of intelligence, to which we regularly apply transient and trendy labels, is one of the great goals that science has envisioned. It is a truly grand challenge for computer science. Modeling thought is on the same grand scale as modeling the evolution of the universe from the Big Bang, or modeling the development of life from DNA and proteins.

Some project links related to AI

- `https://github.com/owainlewis/awesome-artificial-intelligence`
- `https://github.com/jhnwsk/artificial`
- `https://github.com/udacity/artificial-intelligence`
- `https://github.com/jiqizhixin/Artificial-Intelligence-Terminology`
- `https://github.com/opencog/opencog`
- `https://github.com/emilmont/Artificial-Intelligence-and-Machine-Learning`