Human-Level Artificial Intelligence

By Mitchell Kwok

(2006-2007)

Invention summary

Human-Level Artificial Intelligence is a humanoid robot that can think, act, reason, and learn like a human adult, with college level intelligence. Humans learn knowledge in linear stages, from kindergarten to college. Old information is used to learn new information and knowledge in the robot's brain "recursively" builds on top of each other to form complex intelligence.

I apologize for the long summary of the invention. You have to understand the nature of the invention. I took the human brain and reversed engineer it and turned it into a software program. Describing the data structure in 2 pages is impossible. However, I did manage to describe the technology in 25 pages.

Everything in this pdf file has already been disclosed to the public, 2006-2007. During those 2 years I have published 5 books and filed several patents on HLAI.

Table of content:

Page 2-26: Summary of Human-Level Artificial Intelligence

Relevant videos or websites:

http://www.humanlevelartificialintelligence.com

This document is a summary of Human-Level AI. The website above contains my 5th book, entitled: Human-Level Artificial Intelligence: second edition (2007) . If you want a detailed description of my invention, you can read the book free of charge on my website. I recommend reading the whole thing, don't skip any chapters.

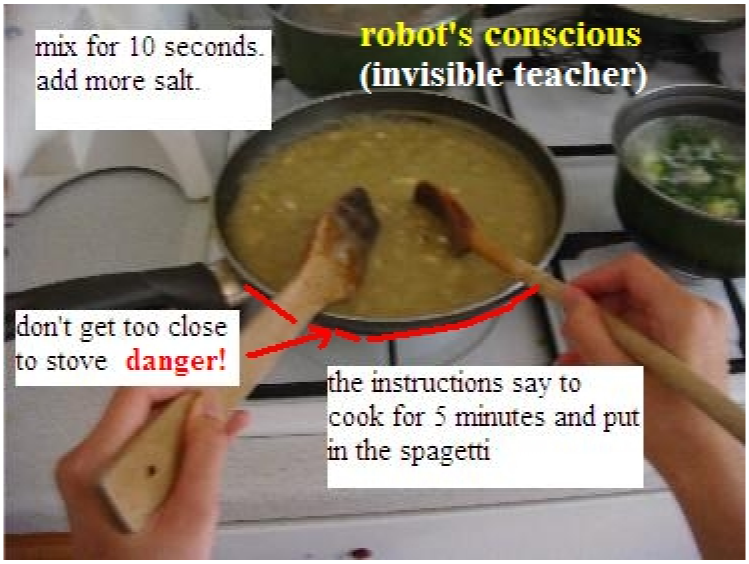
Here is a video describing the data structure to Human Level Artificial Intelligence. There are 2 parts to the video and the entire video is about 1 hour long. If you're short of time just watch this video and it will explain what this technology is and how it works.

http://youtu.be/IFk8iGA7ETg

Here is a quick video demonstration on how my robot thinks. Hypothetically, it shows the internal thoughts of the robot's brain while doing various human tasks (like playing a video game).

http://youtu.be/PkyRSgqRQfE

"The voices in a human mind is like an invisible teacher that: gives information, make decisions, alert the host to danger, observe the environment, id objects, generate common sense knowledge, predict the future, schedule tasks, manage tasks, solve problems, do induction/deduction, understand natural language, etc. This invisible teacher, which exist in a human mind, was created from a lifetime worth of learning from school, through personal experience, and knowledge from books.



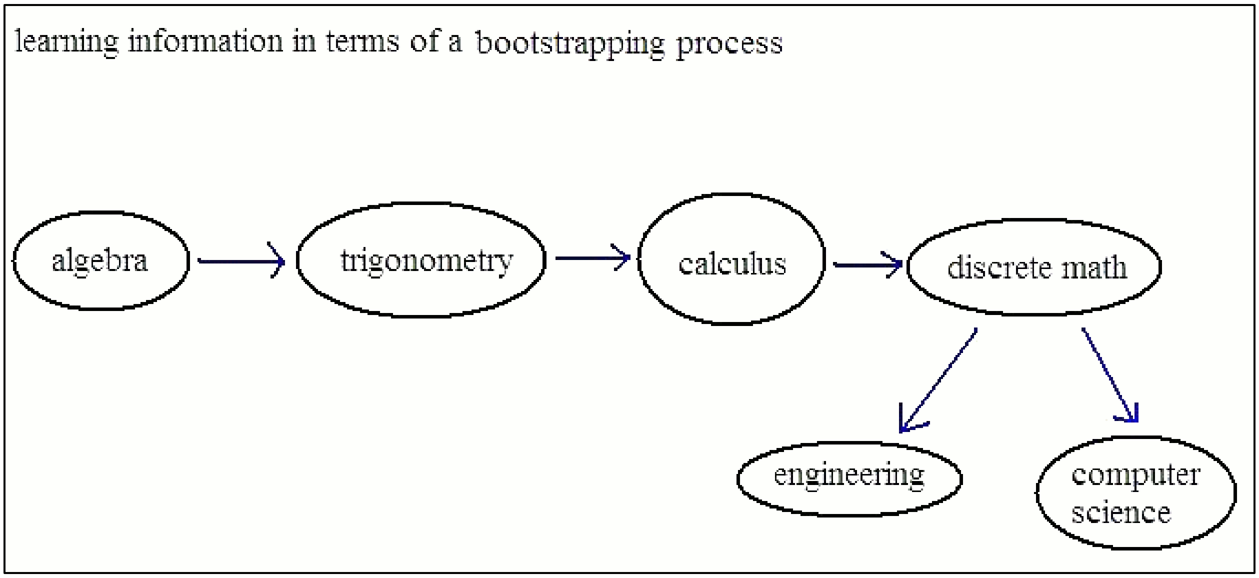
When a person does a human task, like drive a car, play video games, or cook, a voice in their mind speaks to them. For example, if a person is reading a book, a fabricated movie, via thoughts are activated in his/her mind. As the person reads each page, a mini-movie is playing in his/her mind. In another example, when a person is driving a car, thoughts activate, via sound sentences to guide the person to drive intelligently. Sometimes, these activated thoughts might be visual images like maps or arrows to guide the person to drive. The voices in the person's mind are usually in the form of English sentences (sound data), that provide information like goals, rules, procedures, common sense knowledge, and linear instructions to do a human task/s. However, the activated thoughts can be any human 5 sense data: sight, sound, taste, touch, or smell.

My goal, which started in 2002, was to design and build a robot brain that can activate intelligent thoughts just like a human brain.

Summary of Invention

Scientists from MIT and Stanford University have been trying to teach their robots to learn information in a bootstrapping manner. If the robot learns simple math like addition, how can he use that knowledge to solve a science problem? In another example, if the robot learns a complex concept like a binary tree, how can he use that knowledge to write a customer database system?

Humans learn knowledge in linear stages, from kindergarten to college. Old information is used to learn new information and knowledge in the robot's brain "recursively" builds on top of each other to form complex intelligence.



Humans learn math through a bootstrapping manner, whereby information builds on top of each other to form complex intelligence. First we learn algebra, then we take that knowledge to learn trigonometry. Next, we take trigonometry to learn calculus. Finally, we take calculus to learn discrete math or computer science.

Prior art

Google's deepmind technology called deep Q network is a general purpose AI (aka Universal AI) that can play any video game for any game console without any pre-defined rules or goals. Recently, they unveiled DNC and "catastrophic forget" method to play similar Atari games.

Their final destination is to build a universal AI that can play any video game for any game console, including really complex games on X-box or PlayStation consoles, like Call of duty, Zelda, or Metroid. Zelda is a RPG (role playing game) that is thousands of times more complex than Atari games.

The current problem Apple, Google, Microsoft, Ibm and Facebook are trying to solve is to build AI that can play complex video games like call of duty or Zelda (2017). This isn’t an easy task.

In order to play Zelda the AI has to have intelligence and knowledge at a 6th grade level. **" All knowledge and skills" from 6th grade has to be had in order to play Zelda**. This includes: making complex decisions, managing tasks, doing recursive tasks, doing simultaneous tasks, generating common sense knowledge, doing induction and deduction reasoning, navigating in an unknown environment, understanding natural language (at a 6th grade level), learning knowledge, practicing a skill/s, and learning skills to play a general game.

Their AI has to have “all” knowledge and skills at a 6th grade level in order to play Call of duty or Zelda. For example, Google's AI has to know basic math like add or multiply in order to manage bullets in the game or understand natural language to extract rules or goals from a mission letter. At each level of Call of duty, a mission letter is given to the player to read. In the letter are goals and rules the AI has to follow in order to beat that level. Thus, understanding natural language is a vital skill in playing Call of duty.

My AI program, called Human-Level Artificial Intelligence (2006), solves the problem mentioned above. It can not only play complex games like Call of duty, Zelda, or Metroid, but it can do really complex human tasks, like write software programs. If my AI can do something complex like write software programs for Microsoft, then it can practically do any human job.

5 books and several patents were filed between 2006-2007 on Human-Level Artificial Intelligence.

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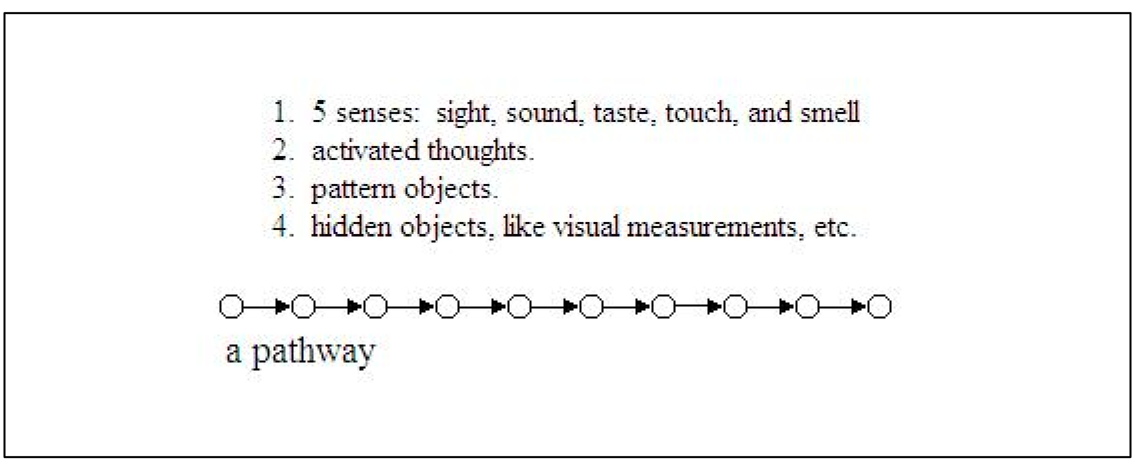
Human Level Artificial Intelligence

This AI program is really long. For a detailed description of the AI program go to my website. Only a summary of the AI program will be described in this document.

I'm proposing a humanoid robot, with the same body parts as a human, that simply goes to school to learn all knowledge and skills (from kindergarten to college). This isn't machine learning nor is it deep learning; and there are no training involved. It's simply a robot (aka AI program) that lives life and learn knowledge through personal experiences.

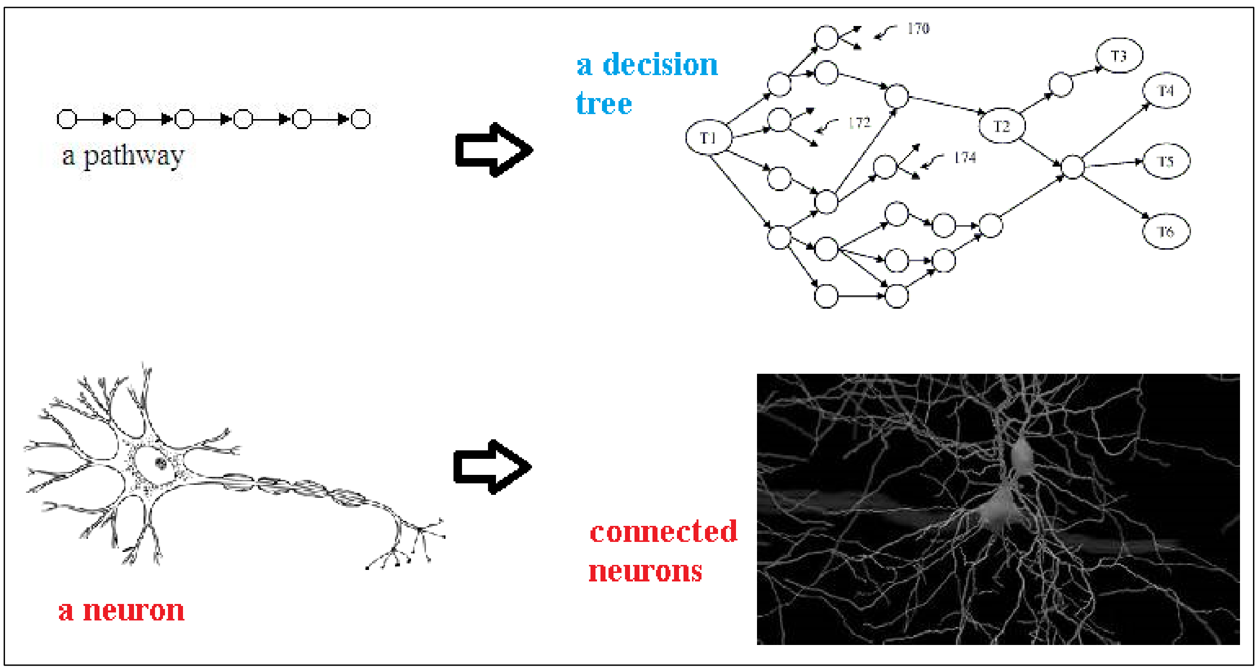
The human brain is a recording device that records 5 sense movie sequences, called pathways. These movie sequences store the 5 senses: sight, sound, taste, touch, and smell. Muscle movements and pain/pleasure is a part of the touch sense and included in the pathways sequentially, frame-by-frame.



These frame-by-frame pathways store the robots: 5 senses, thoughts, motor functions, internal intelligence and physical actions.   It also store things like the robot's objectives, rules to follow, recursive goals, and linear procedures.

Pathways store linear data like the English ABC's or verses from the bible.   As the robot experiences life, the pathways become longer and stronger (forming decision trees).   The pathways are also subject to forget and it will break itself into a plurality of elemental pathways with lower "data quality".   In other words, the more it forgets the harder it is for the robot to remember an experience.

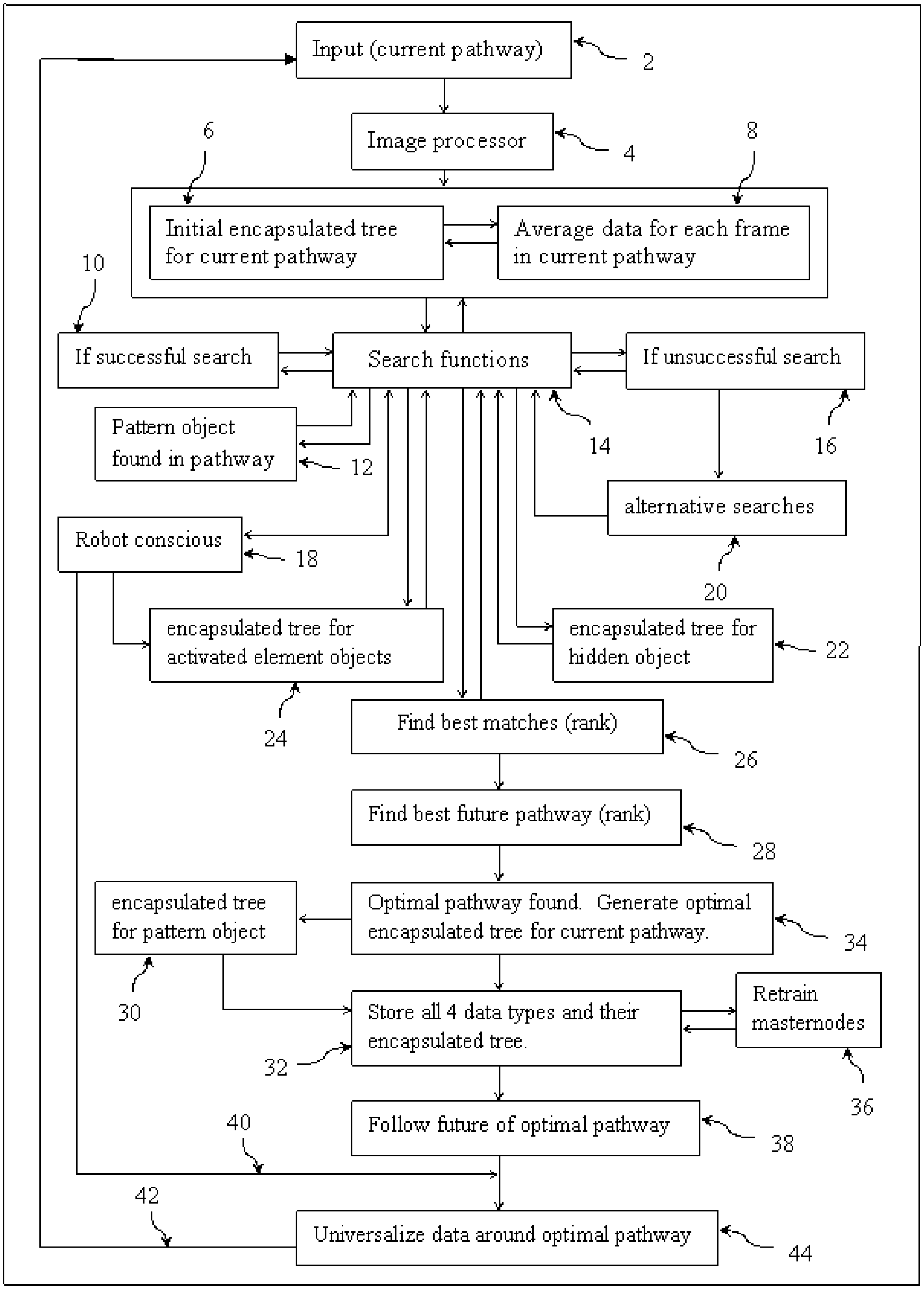
The diagram below shows: a neuron can be represented as a pathway.   These pathways store possibilities of life and forms decision trees.   Later on, I will discuss how these pathways can even form self-creating semantic networks, self-creating database systems, and self-creating state machines.



The purpose of pathways is to store both static information and linear information from the point of view of the robot.   A picture is considered static information, while the steps to cook a hamburger is considered linear information.   Pathways are structured hierarchically and this is where deep learning is applied to each pathway experienced by the robot.   Deep learning stores static information, like a picture, or sequence data, like the instructions to cook a hamburger, in an optimal manner where information is shared (using hierarchical trees) and repeated information are minimized.

Overall AI program

FIG. 1



These pathways are stored and referenced in both short-term and long-term memory. Each pathway experienced by the robot is structured hierarchically (aka encapsulated tree) and they self-organize in memory, forming a fuzzy range of itself. The robot forgets information in a hierarchical manner, whereby important objects float to the top and minor objects float to the bottom; and the minor objects located at the bottom are subject to forget.

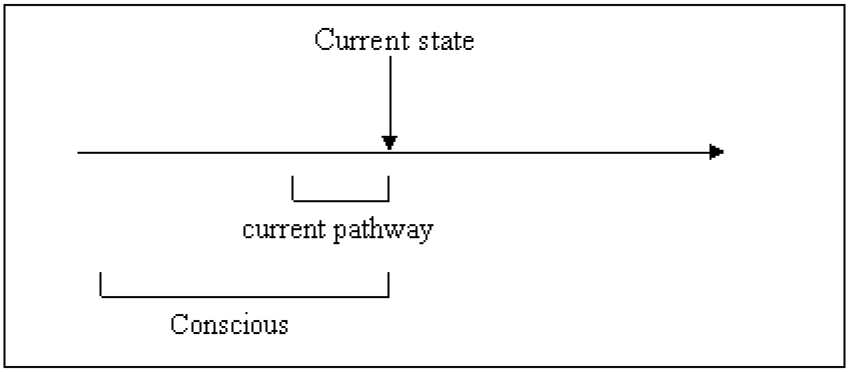
The main function of the robot is to select pathways from memory to take action. So, if the robot is flying a plane he will select pathways to fly based on the current state. It will extract a specific pathway in a decision tree to take action that will benefit itself in the future.

Main function of the AI program (robot)

The basic idea behind the AI program is to **predict the future** using pathways in memory (FIG. 1). The AI program will receive input from the environment based on 5 sense data called the current pathway. The image processor will break up the current pathway into pieces called partial data. The image processor also generates an initial encapsulated tree for the current pathway. Each partial data will be searched individually and all search points will communicate with each other on search results. Each search point will find better and better matches and converge on the current pathway until an exact/similar pathway match is found or the entire network is searched. During the search process, visual objects will activate element objects (learned objects) or create hidden objects. Each new object created by the visual object/s will generate their respective encapsulated tree and included in the initial encapsulated tree. The optimal pathway is based on two criteria: the best pathway match and the best future pathway. After the search function is over and the AI program found the optimal pathway, the AI program will generate an optimal encapsulated tree for the current pathway. All 5 sense objects, all hidden objects, all activated element objects (or learned objects) and all pattern objects will recreate (or modify) encapsulated trees based on the strongest encapsulated permutation and combination groupings leading up to the optimal pathway. Next, the current pathway and its' optimal encapsulated tree will be stored near the optimal pathway. Then, the AI program follows the future instructions of the optimal pathway to take action. Next, it will self-organize all data in and around the optimal pathway, compare similar pathways for any patterns and universalize data around that area. Finally, the AI program repeats the function from the beginning (1 for-loop, executed every 20 millisecond).

The main function of the robot is to predict the future by selecting pathways in memory that will lead to pleasure and avoid pathways in memory that will lead to pain. Future prediction is done using sequences from memory (4 methods are proposed in my patents to predict the future in a hierarchical manner). Intelligence, via the robot's thoughts, can also be used to predict the future.

As the robot's brain selects optimal pathways over a period of time, a computer program is generated to take action. If the robot is driving a car, a computer program is created in his mind to drive a car. If the robot is cooking, a computer program is generated in his mind to cook. If the robot is flying a plane, a computer program is created in his mind to fly a plane. This computer program, which is generated in the robot's mind, is known as the robot's conscious.



Output of the AI program (the robot's conscious)

The output of the AI program are activated thoughts, intelligent thoughts to manage tasks, make decisions, and taking action.

There are 2 types of activated thoughts:

1. Activate thoughts based on currently sensed data. This method activates thoughts based on new experiences.

2. Activated thoughts based on data in memory. Pathways store previously activated thoughts. When data self-organizes in memory, it prioritizes objects in pathways. The strongest of these objects will activate in the mind.

Thus, the first type of thoughts is based on current and new experiences and the second type of thoughts is based on old experiences. Both methods compete with each other to activate linear thoughts inside the robot's mind.

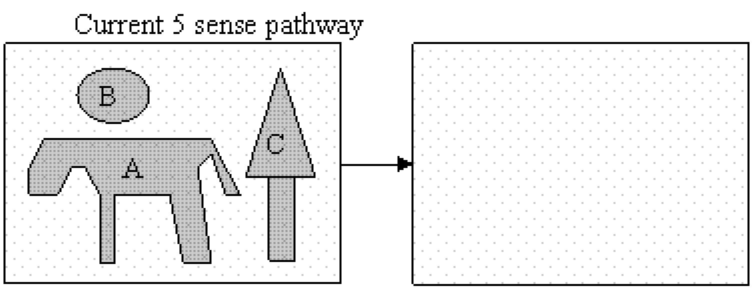
The next couple of sections will describe, in detail, what the robot's conscious is and how the conscious is used to solve problems, plan tasks, predict the future and so forth. These sections are mentioned in detail in my book, but I will give a summary explanation so the readers can have a better understanding of how human intelligence is produced in a machine.

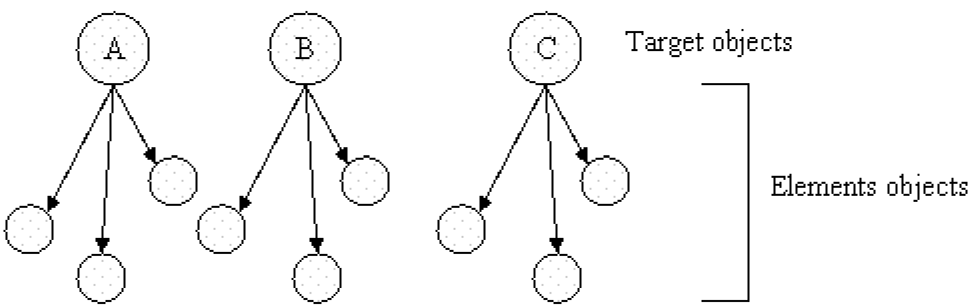
1. first type of activated thoughts

The human conscious works by the following steps:

- The AI program receives 5 sense data from the environment.

- Objects recognized by the AI program are called target objects and element objects are objects in memory that have strong association to the target objects.
- The AI program will collect all element objects from all target objects and determine which element objects to activate. Each target object might have multiple copies in memory so each target object will gather element objects from all or most same copies in memory.
- All element objects will compete with one another to be activated and the strongest element object/s will be activated.
- These activated element objects will be in the form of words, sentences, 5 sense data, images, or instructions to guide the AI program to do one of the following: provide meaning to language, solve problems, plan tasks, solve interruption of tasks, predict the future, think, or analyze a situation.
- The activated element object/s is also known as the robot's conscious.





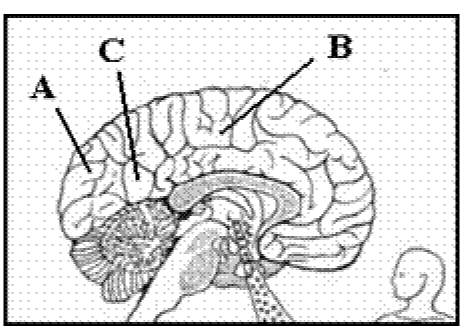
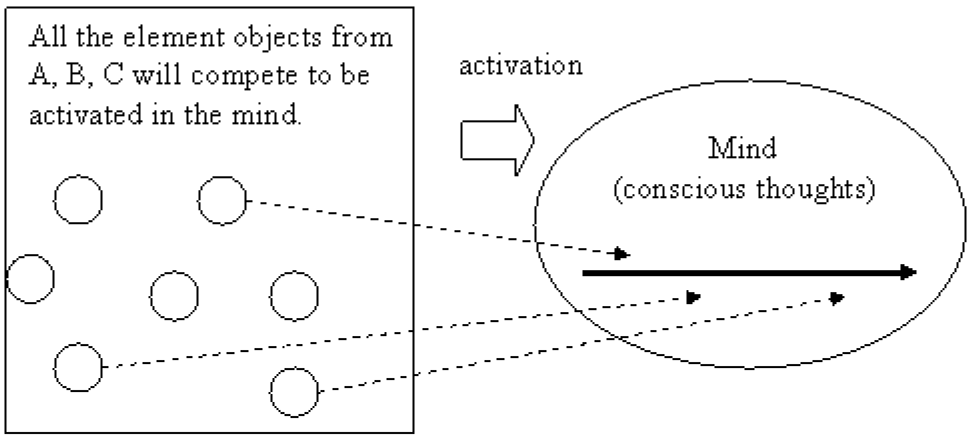
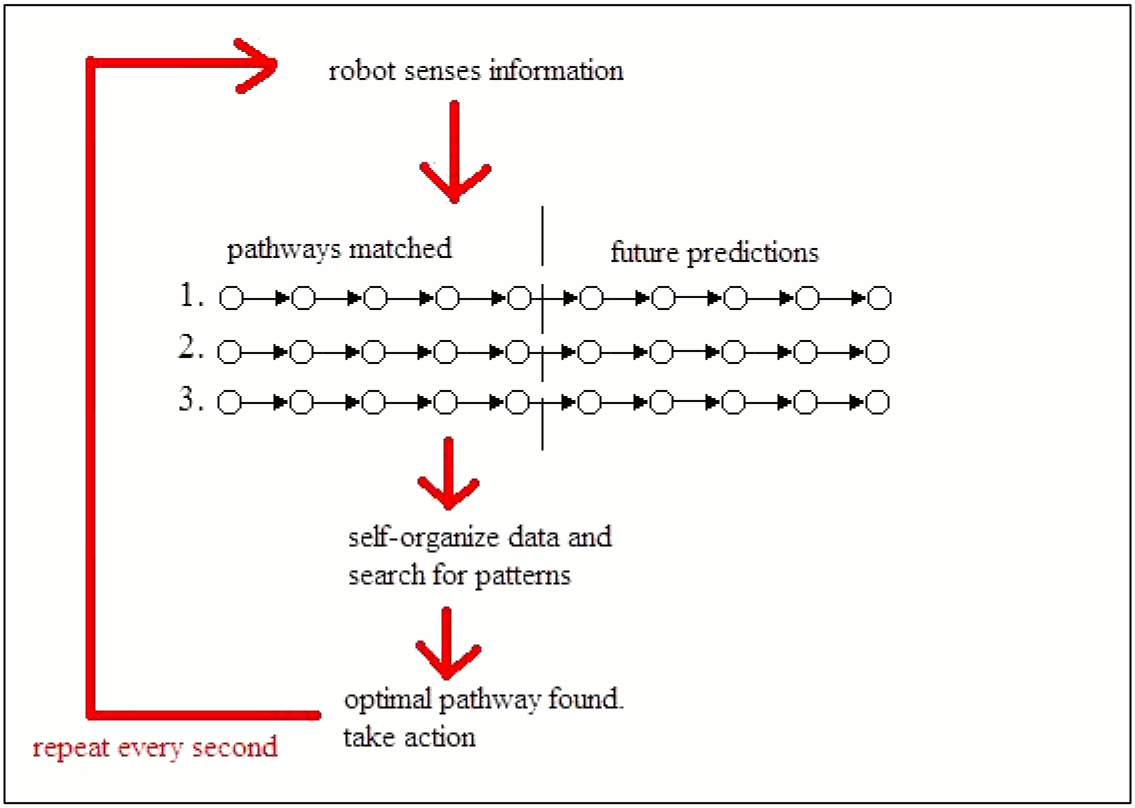


FIG. 2B



Referring to FIG. 2A, when the AI program locates the three visual objects: A, B, C in memory it will run electricity through these nodes and all of its connections.

The mind has a fixed timeline. Only one element object can be activated at a given time in this timeline. This is how we prevent too much information from being processed and allow the AI to focus on the things that it senses from the 5 senses (FIG. 2B).

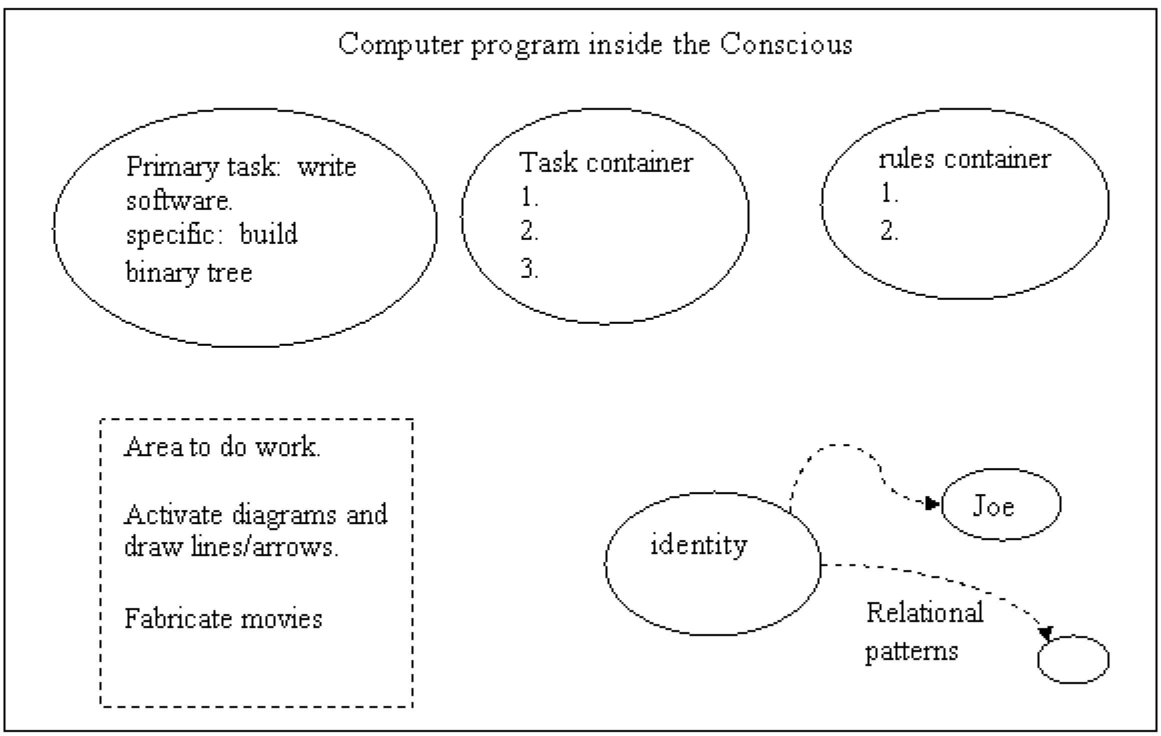


2. second type of activated thoughts.

Referring to FIG. 34 above, in each for-loop, the AI program extracts optimal pathways in memory to take action. The instructions in the optimal pathway is the second type of activated thoughts.

These 2 methods of activated thoughts form the robot's conscious.

The conscious does many different things for the robot. Four of the most important things the conscious does are: 1. manage tasks. 2. establish rules to follow, based on the tasks. 3. planning steps to achieve tasks. 4. know identity. Referring to FIG. 6, there are four containers the computer program in the conscious generated as a result of intelligent pathways: the task container, the rules container, the planning container and the identity container. All data from all four containers influence each other one way or another. For example, the rules will influence what tasks to follow/abort and the planning information will influence what rules to follow or what tasks to do.



These containers are just temporary caches inside the conscious that was generated by intelligent pathways in memory. Based on the current environment, the robot selects an optimal pathway from memory and that optimal pathway has instructions to create containers so that groups of data could be manipulated and logical thoughts and actions can be had by the robot. The intelligent pathways create any type of computer program or discrete mathematical functions to manipulate data in the conscious -- a database system, an operating system to manage multiple threads, a NLP system, an image processor to compare images, a search engine to find information in memory, or any software program.

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How does the robot learn information in terms of a bootstrapping manner, whereby old information is built on new information to form complex intelligence?

Intelligent pathways in memory (details)

First, the robot has to learn English grammar in kindergarten and first grade. He has to have a basic grammar understanding. Next, using English sentences, teachers teach the robot how to think, act, learn, and make decisions.

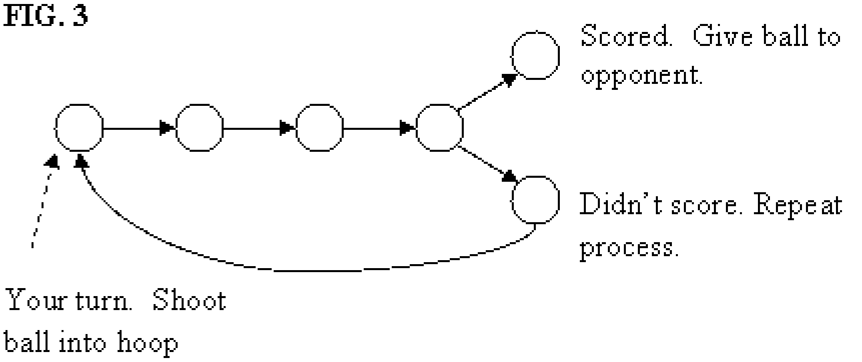
The main purpose of pathways in memory is to create any form of intelligence. The pathways should contain patterns that will control the AI program to take action in an intelligent way. Instructions in pathways control the robot's body functions such as moving its arms and legs or searching/modifying/processing/and storing information in memory or thinking consciously of intelligent ways to solve problems.

English sentences is a fixed object, referencing the beginning of a pathway/s. Sentences reference pathways all over the brain, regardless of where they are located. Thus, when the robot activates a sentence (activated thought), it searches the memory part to find the beginning of the sentences' respective pathway. This is how my robot's brain reference "blocks of domains", regardless of where they are located in memory or how complex these domains are.

The key to human intelligence

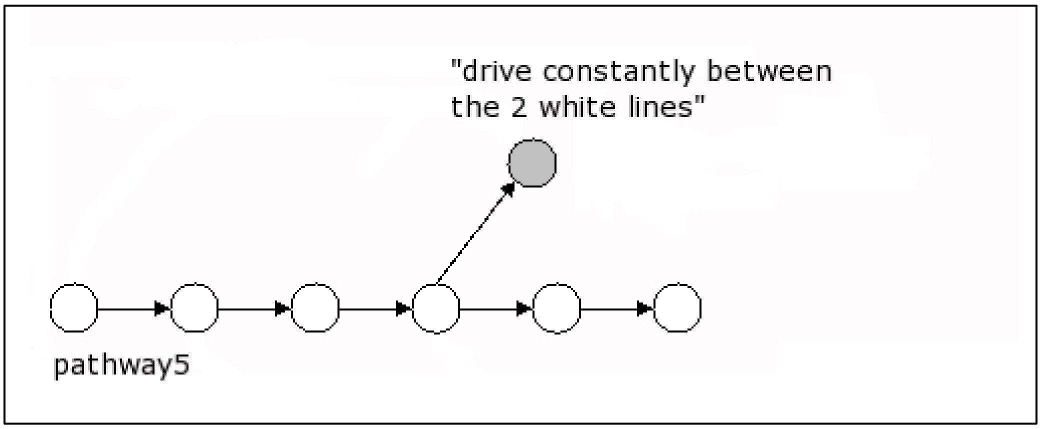
Language is the key to how these pathways are structured in an intelligent manner. Language will define the functions and behaviors of each pathway in the robot's brain. In FIG. 3, the sentence: "shoot the basketball until it goes into the hoop" is a for-loop that will loop itself based on a condition/s.

FIG. 3

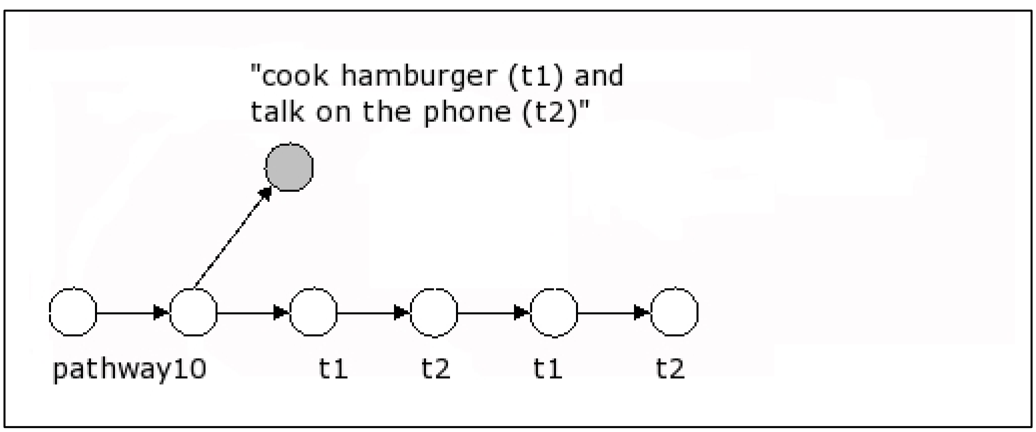


Notice that a sentence/s marks the beginning of a pathway or a sentence/s marks the beginning of a function or operation. A given pathway can have a plurality of sentences or possible sequences (almost like a smart tree/forest). Think of pathways as connected dendrites in a human brain that can form complex data structures.

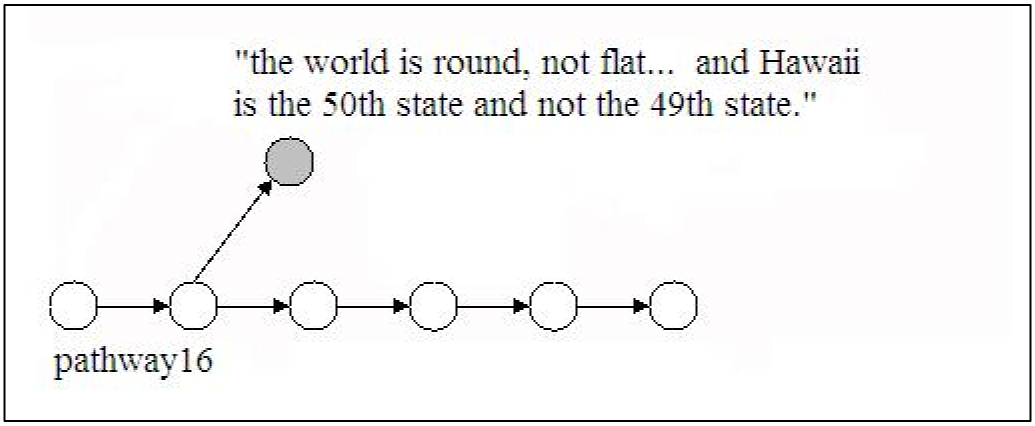
In this example, the sentence: "constantly drive between the 2 white lines" is a constant rule that tells the pathway to constantly follow this rule while driving.



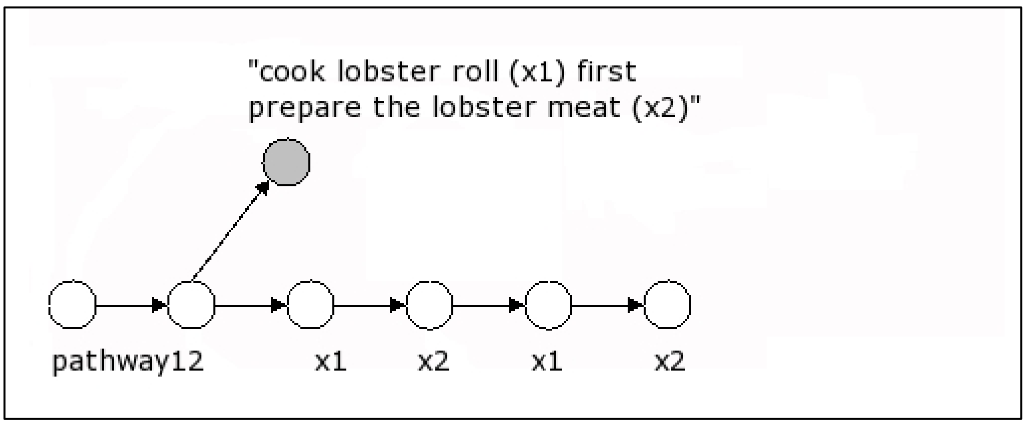
In this example, the sentence: "cook hamburger and talk on the phone simultaneously" manage 2 tasks simultaneously by switching between tasks until both tasks are completed.



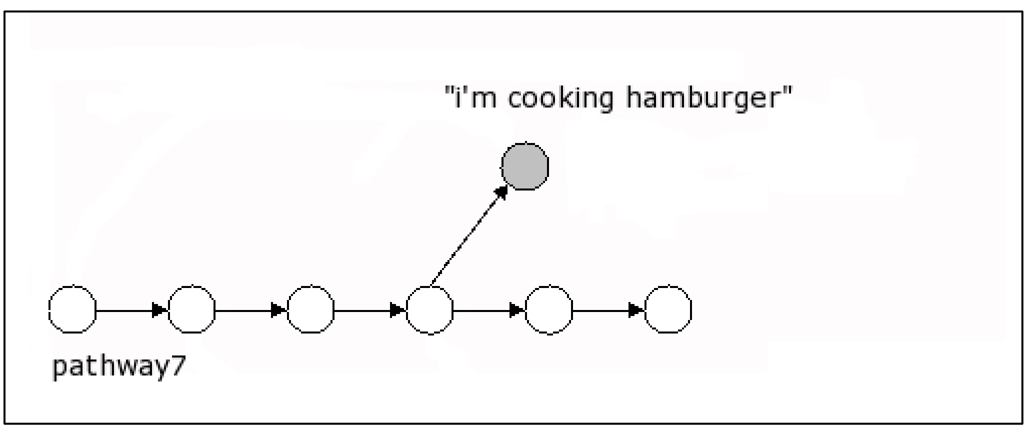
In this example, the sentence: "the world is round, not flat... and Hawaii is the 50th state and not the 49th state." is forcing the robot's brain to correct wrong information stored in memory. In this case, the correct data is created in memory (marked as correct) and the wrong data will have a forget function next to it (marked as wrong). Thus, the next time the robot retrieves the fact, the correct data will be present. This example shows pathways can do complex database functions.



In this example, the sentence: "cook lobster roll. First, prepare the lobster meat" manages recursive tasks. The 2 sentences basically manage recursive tasks. It knows it is currently making a lobster roll. At the same time, it also knows that the first step is to prepare the lobster meat. After finishing the first task the second task will pop up in the robot's brain.



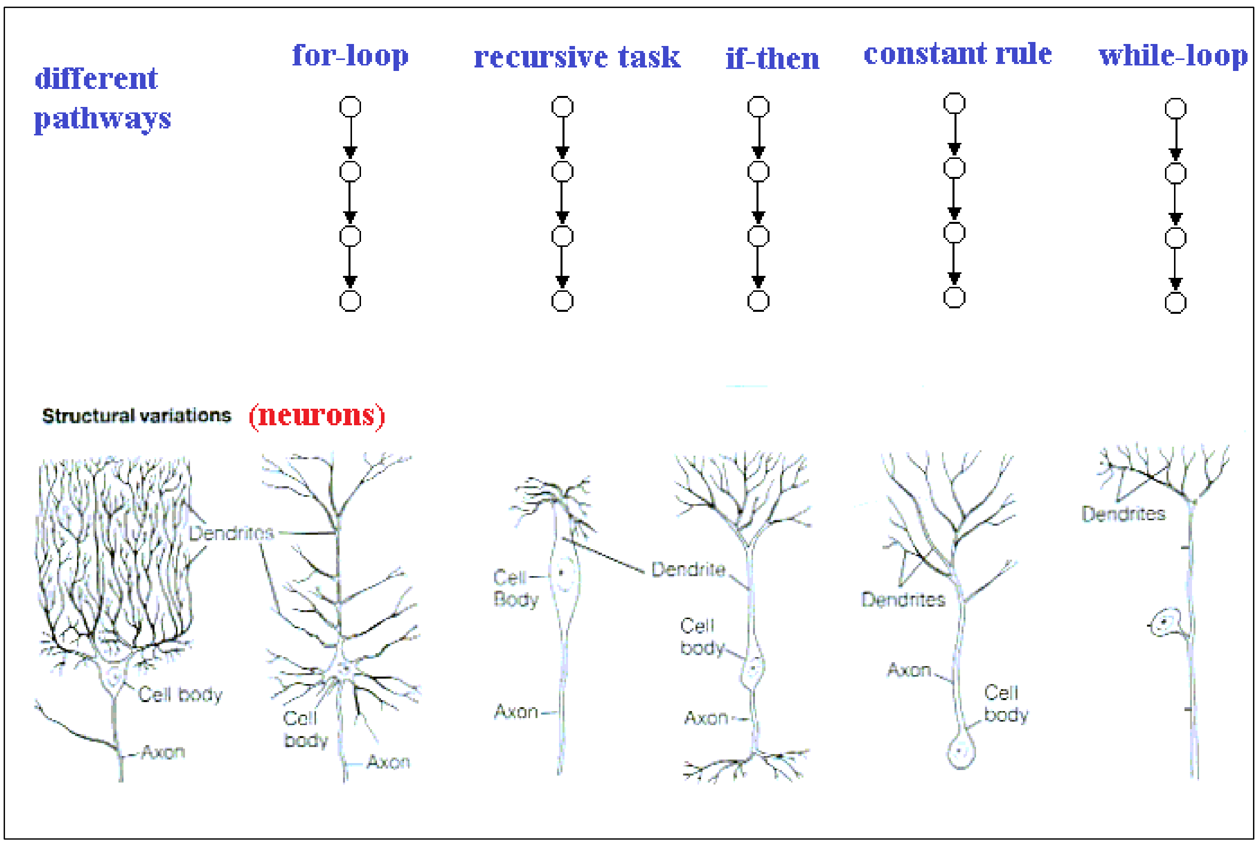
In this example, the sentence: "cook hamburger" is a constant task. The pathway will contain the beginning and ending of the task.



The pathways in memory can form for-loops, while-loops, if-then statements, and-statements, or-statements, assignment statements, sequence data, recursive functions, classes, procedures, random data, static data and all the different combinations. The pathways are also able to form any type of computer program, including: databases, expert systems, genetic programs, and AI programs. Simple computer programs like a word processor or complex computer programs like the internet can form in pathways. The pathways can even form self-learning and self-accomplishing behavior to solve arbitrary problems.

The intelligent pathways can do anything that a state machine can do. Self-organization between similar intelligent pathways is the tool that defines the state machines.

The diagram below shows various elemental neuron structures. These elemental neurons are exactly the same as different types of pathways. In computer science they teach you that operational functions like for-loops, if-then statements, while-loops, oop, recursive functions, or-statements and so on are the elemental building blocks to any computer program. Neurons in the human brain work exactly the same way. These elemental neurons build on top of each other (based on learning) and form complex structures in the human brain to think and act.

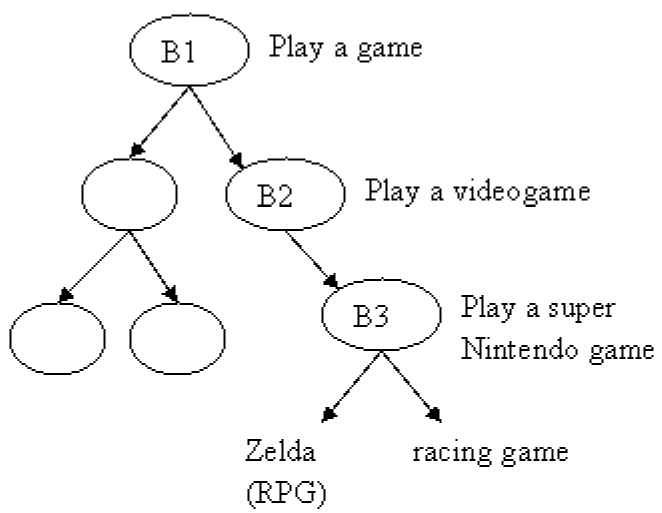


Pathways build on top of each other to form complex intelligence

As the robot learns information from school, pathways in its brain become more complex and intelligent. It becomes self-aware after a certain point (about age 3) when it begins to make its own decisions based on pain and pleasure. FIG.13 shows a really complex pathway to play a game. This pathway contains linear instructions and decision making in terms of playing "any" game. I will go into the details of this diagram later on.

All human tasks have one commonality: every human task is like a game, they have rules, goals and procedures. As the robot learns different skills, these skills self-organize in memory and form massive network of forests and trees, hierarchically structured. Games and human skills are structured hierarchically based on similarities. Skills like driving, playing sports, playing board games, playing video games, or cooking self-organize and form a hierarchical structure.

FIG. 13 Hierarchical structure of playing a game



Referring to FIG. 13, pathway B1 is a universal pathway to play any game. The steps in B1 are very general, in that, all games played have these linear steps. If you observe a sports game or a board game, they have these general steps. B2 is a more general pathway to play a game. In this case, B2 represent playing a video game. All the intelligent pathways (B1-B3) are all encapsulated and structured in a hierarchical manner so that the data goes from general to specific. Intelligent pathway B3, on the other hand, record detailed steps to play a specific game. If the game is the legend of Zelda, the steps to playing this game are different from the steps to playing a racing game.

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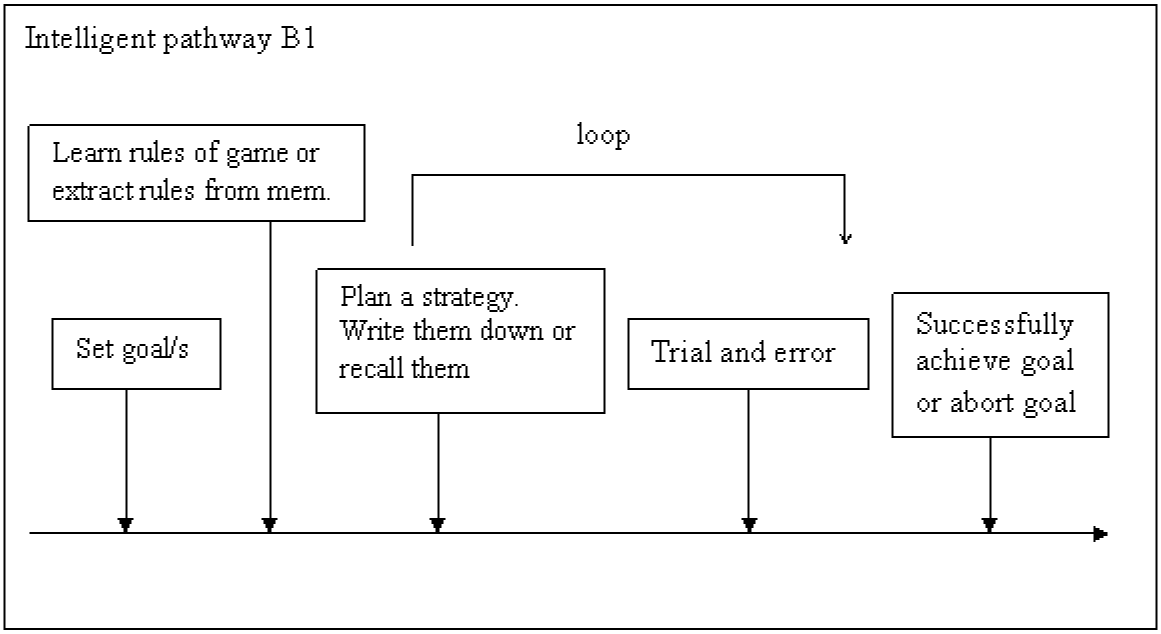
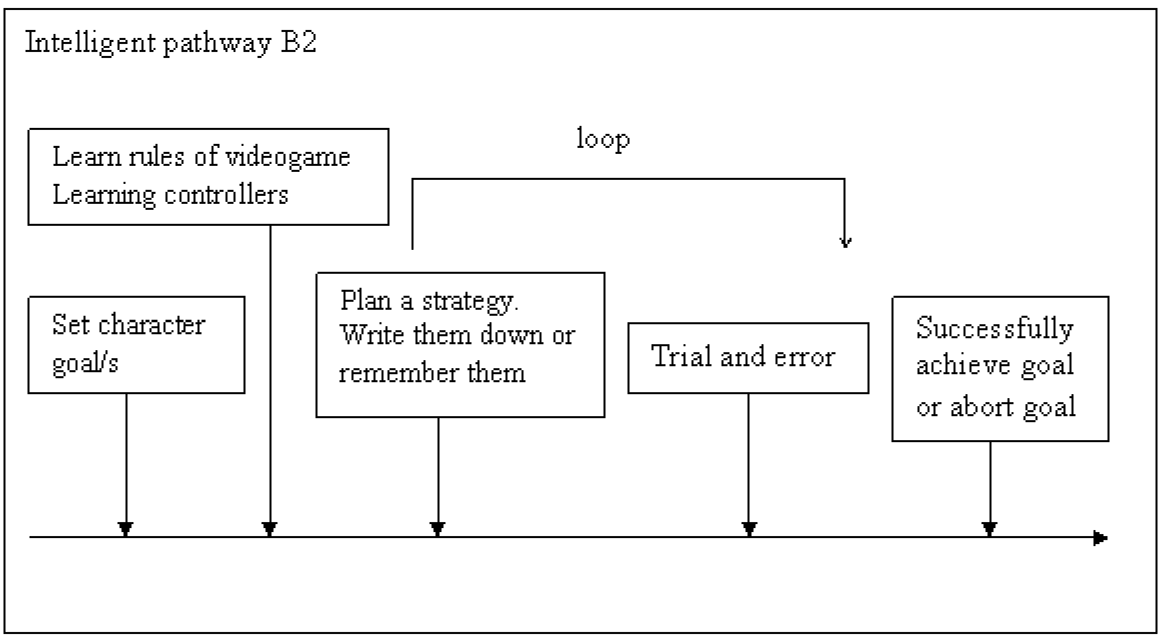
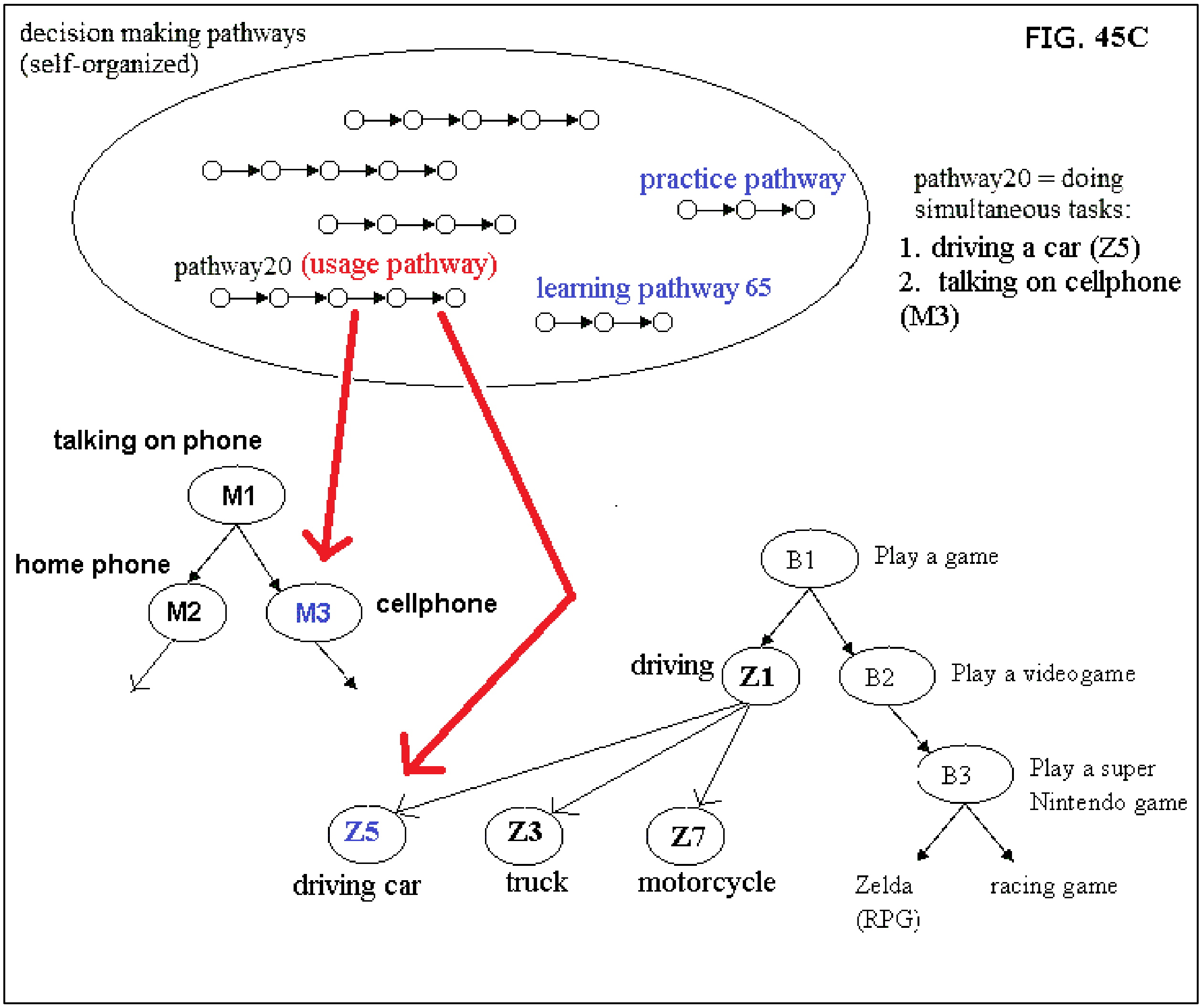




By the way, Pathway B1 is learned from teachers in school. Teachers teach the robot how to play a general game. Obviously, the first step in playing an unknown game is to seek out the rules and objectives. Next, after understanding the rules and objectives of a game, the robot can practice to refine his skills. After several tries the robot will have the knowledge to play an unknown game.

Let's say the robot has never played video games before and doesn't understand how it works or what the objective of the task is. The robot will use pathway B1 to learn how to play video games. After many weeks of practicing, pathway B2 is created in memory. Next, the robot wants to play a new type of video game called Zelda that it has never played before. He will use pathway B2 and B1 to learn to play Zelda. After several hours of playing, the robot created pathway B3 in memory.

This is how the robot learns by itself without any guidance from teachers. Pathway B1 is very affective because it allows the robot to teach itself how to learn.



This is a visual overview of what the memory part of this robot's brain looks like and it is very similar to neuron structures in a human brain. The data stored in memory are pathways, which are linear sequences based on the human 5 senses: sight, sound, taste, touch and smell. There are other data stored in pathways, which are: hidden data, activated thoughts, and pattern data.

By the way, pathways store linear data, as well, as static data. Static data is classified as objects existing in linear data. A 2-d picture is a static data that exist in a linear movie sequence.

Each pathway is structured hierarchically and stored in memory based on 2 factors: object association and hierarchical similarities. One example of object association is meaning to language. For example, the text "cat" is associated with a visual image of a cat and these 2 objects will gravitate towards each other because of association. An example of hierarchical similarities is human skills. Driving a car is similar to driving a motorcycle. Since these two skills are similar their respective data gravitate towards each other.

The purpose of pathways is to store life experiences in a fuzzy logic manner, whereby data are structured hierarchically and they share information. For instance, if the robot learns 10 million different cat images, each cat image is structured hierarchically and they share information, forming something called a cat object. All data is stored using fuzzy logic.

This memory graph isn't a neural network (FIG. 45C). There are no input layer, hidden layers or output layer. Each pathway sensed by the robot is broken up into a hierarchical tree (aka encapsulated tree) and stored in memory; and they self-organize in a 3-d grid based on 2 factors: object association and hierarchical similarities. There are no training involved or inputting massive data sets (machine learning or deep learning).

This robot simply learns all knowledge through school; and by interacting with the environment. The robot learns decision making, social skills, generating common sense knowledge, induction and deduction reasoning, solving problems, learning knowledge, practicing a new skill or old skill, and understanding natural language by going to school and learning from teachers.

Let me give several examples. In the decision making pathways is pathway 65, which is a learning knowledge pathway. This pathway allows the robot to learn information through books or lectures. If the robot doesn't know how to drive a car, he can seek that knowledge by reading books or attending driving school. Teachers taught the robot how to seek knowledge in books and identify important information like identifying rules, goals and procedures of driving.

Next, pathway34 is a practice pathway. Teachers in school taught the robot how to practice a new skill or improve an old skill. If the robot has the knowledge of driving and he understands the rules, goals, and procedures, then the next step is to practice so he can store linear procedures in memory to drive a car.

With pathway65 (learning knowledge) and pathway34 (practice pathway), the robot is able to learn a new skill.

Pathway20 is a decision making pathway to do 2 simultaneous tasks. The first task is to drive a car and the second task is talking on a cellphone. This pathway manages 2 tasks simultaneously by switching between tasks until both tasks are completed. Pathway20 is universal and can be used to do any 2 tasks and references task1 and task2 from various parts of memory.

Referring to FIG. 45C, every data in memory are hierarchically structured. This is the end result.

After 21 years of learning, the decision making pathways are located at the top, which controls all decision making and intelligence for the robot.

Below the decision making pathways are the individual tasks, all self-organized in a 3-d grid and structured hierarchically. And below the task pathways are the static data, other reference recursive-pathways, and knowledge.

The top layer, the decision making pathways, allows the robot to be self-aware and gives it the freedom to choose and make its own decisions. Pain and pleasure will determine what actions to take and the main function of the robot is to always take action that will lead to pleasure.

Conclusion:

Thus, all knowledge learned by the robot comes from teachers in school. Learning knowledge from books or lectures come from teachers. Practicing and learning procedures of a skill comes from teachers in school, making decisions also come from teachers in school. Even learning to play a general game comes from teachers in school. If the robot doesn't know how to play a game (doesn't know the rules, goals, or procedures of a new game), teachers teach the robot how to seek out knowledge and to use trial and error and common sense to play an unknown game. Even something like adapting to a changing environment or doing a similar task are all learned from teachers in school. If the robot has his right arm chopped off, he can still make a sandwich -- by adapting. Teachers in school "teach the robot how to teach itself to learn".

One example is writing software programs. If the robot was given an assignment to write a customer database system using a binary tree, the robot has to take knowledge about binary trees and take knowledge about software engineering to write the source codes. This shows that the robot can take 2 very complex concepts and merge them together. Again, teachers teach the robot how to merge two (or more) tasks together.

If you think about it, the voices in a human mind is actually the accumulation of lessons learned in school from kindergarten to college. All lessons from teachers are averaged out and self-organized in the robot's brain. The voices in a human mind is like an invisible teacher that gives a person intelligent instructions to take action, under any given situation.

Example of learning information in terms of a bootstrapping process (learning to write a book):

FIG. 16A

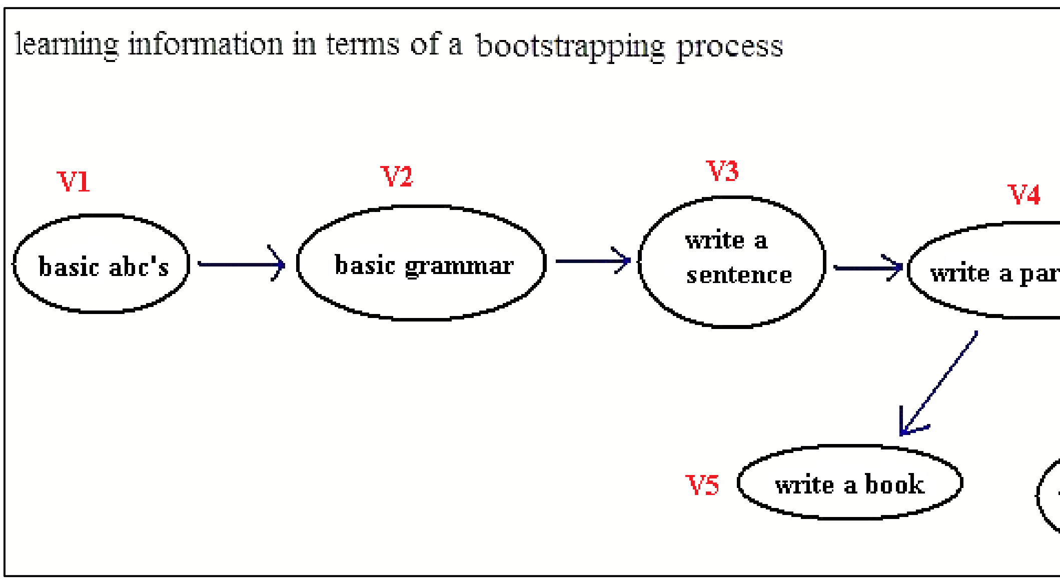
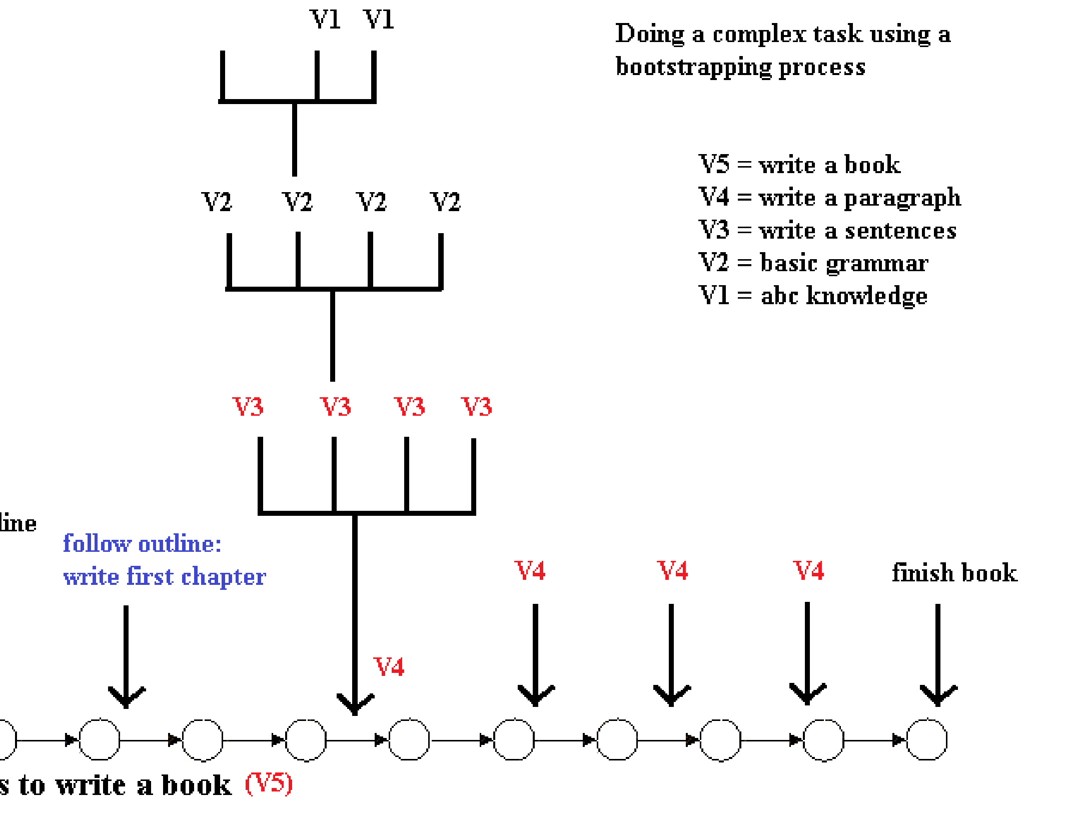


FIG. 16B



Language encapsulate entire knowledge and allow the robot to learn different skills in a bootstrapping manner. FIG. 16A shows a diagram depicting how the robot learns to write a book. English sentences are used to encapsulate entire instructions, called pathways.

Referring to FIG. 16A, first, the robot learns to write words and understand basic grammar rules (V1-V2). Next, he takes those skills to write a sentence (V3). Then he takes the knowledge of writing a sentence to write a paragraph (V4). Finally, the robot takes previous knowledge to write a book (V5). Notice in FIG. 16B, said robot is using previously learned skills to write a book (V1-V4). For example, he is repeatedly using basic grammar rules, writing sentences, and writing paragraphs to write a book. As you might recall, writing a paragraph requires writing several sentences and using basic grammar rules.

English sentences represent a task or sub-task. Sentences is a fixed object that can represent a fuzzy or abstract concept. There are many cats in this world, coming in different sizes, shapes, and 3-d animation, but the word cat is a fixed object to represent a broad range of the species.

We live in a chaotic world. Language brings order to chaos.

In this case, sentences are used to represent or encapsulate very complex tasks. This type of encapsulation allows complex intelligence to form in the human brain, and enabling us to solve college level problems.

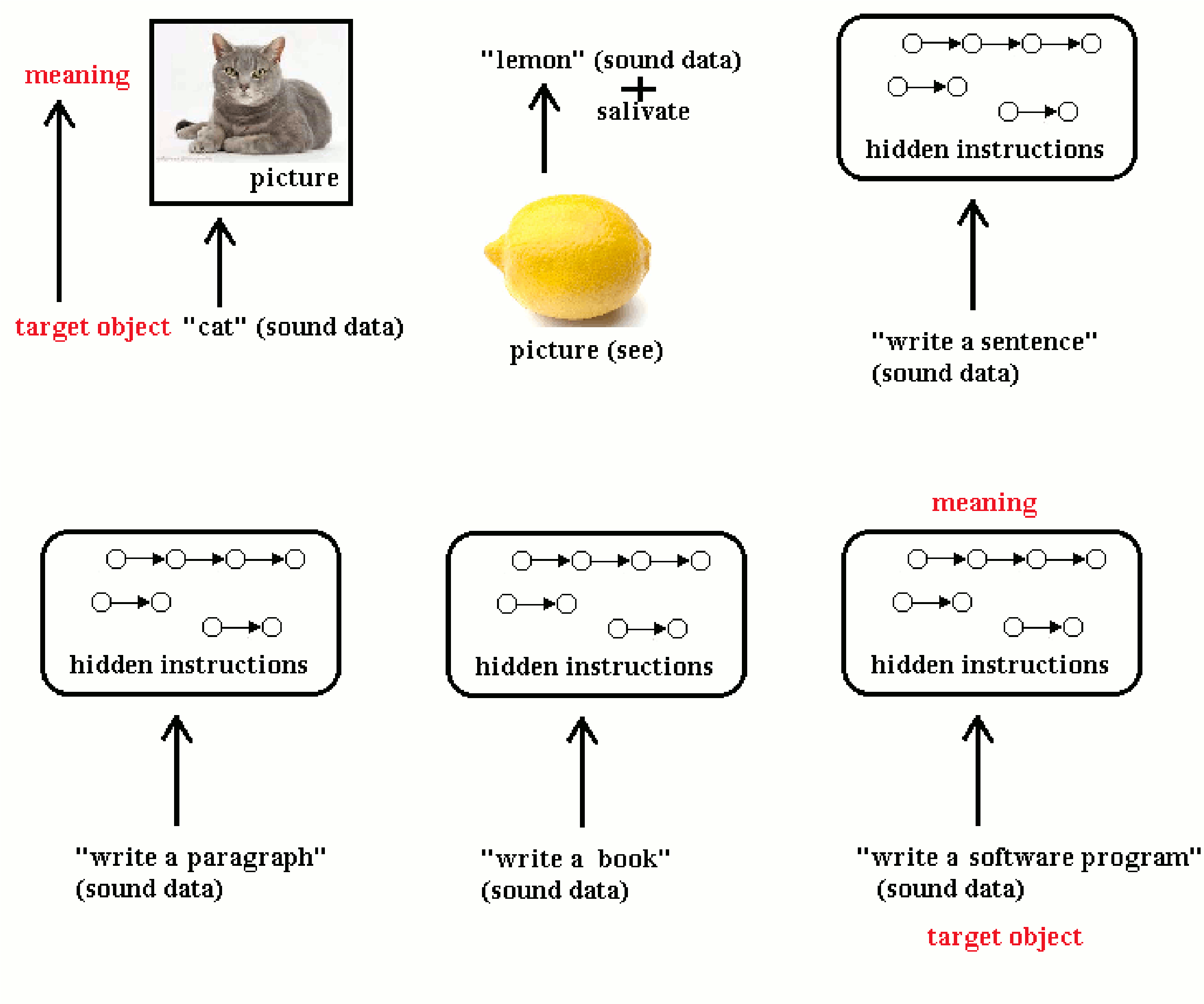
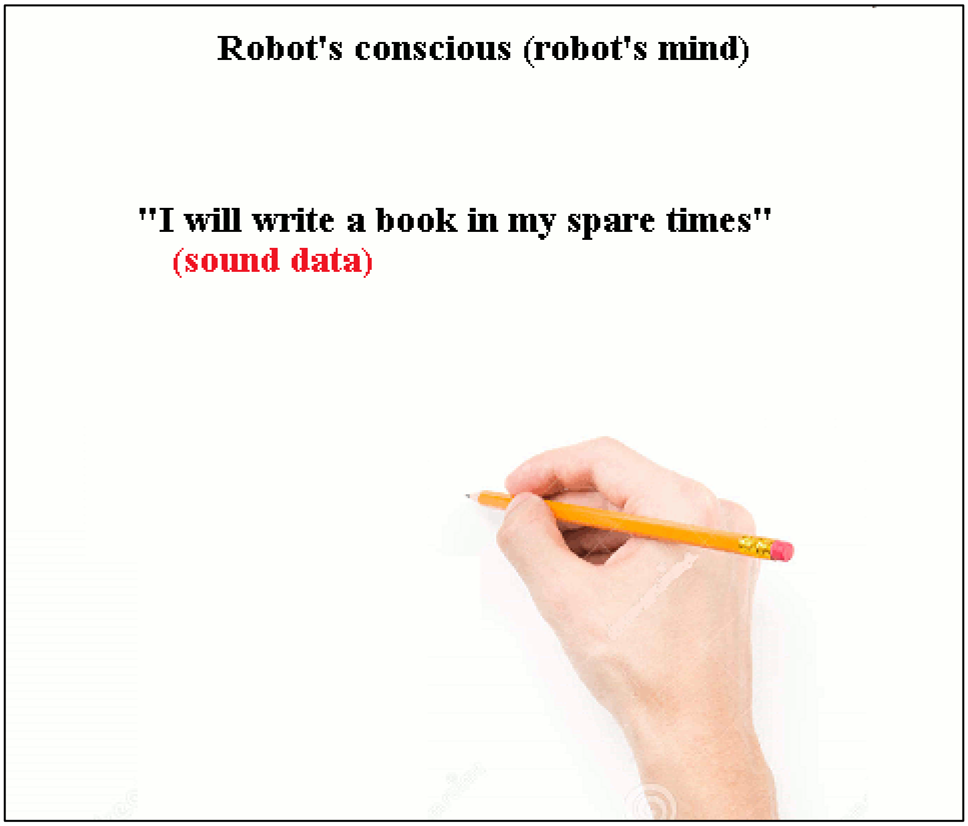


FIG. 11 depicts several examples of words and sentences representing abstract objects or actions. When the robot senses the target object, the meaning automatically activates in his mind. A simple example is shown in the first 2 items. If the robot hears the sound "cat" the meaning to the word will activate in his mind. In this case, a picture of a cat or a primitive cat movie will activate in the robot's mind. In the second item, a picture of a lemon is sensed by the robot and the meaning to the picture activates in his mind. For the robot, the sound "lemon" will be heard in his mind. Also, the picture of a lemon causes the robot's saliva to secrete from his mouth. This is because sour and the sound "lemon" has strong association with a picture of a lemon.

Sentences can also represent very complex instructions. The sentence, "write a book(V5)", encapsulate the entire instructions to write a book. The sentence, "write a paragraph(V4)", encapsulates the entire instructions to write a paragraph. As a reminder, writing a book(V5) utilizes (V4) repeatedly and V4 uses V3 repeatedly and V3 uses V2 repeatedly. The English language allows the robot's brain to recursively encapsulate groups of instructions to a fixed media, which is a word or a sentence/s and allow knowledge to form complex structures.

When the robot is making a decision and the sentence: "write a book in your spare times", activates in his mind, the sentence encapsulate all the complex instructions to write a book. That one sentence represents all the knowledge the robot needs to write a book. This sentence is also known as an internal instruction, given by the robot, to itself, to take action.



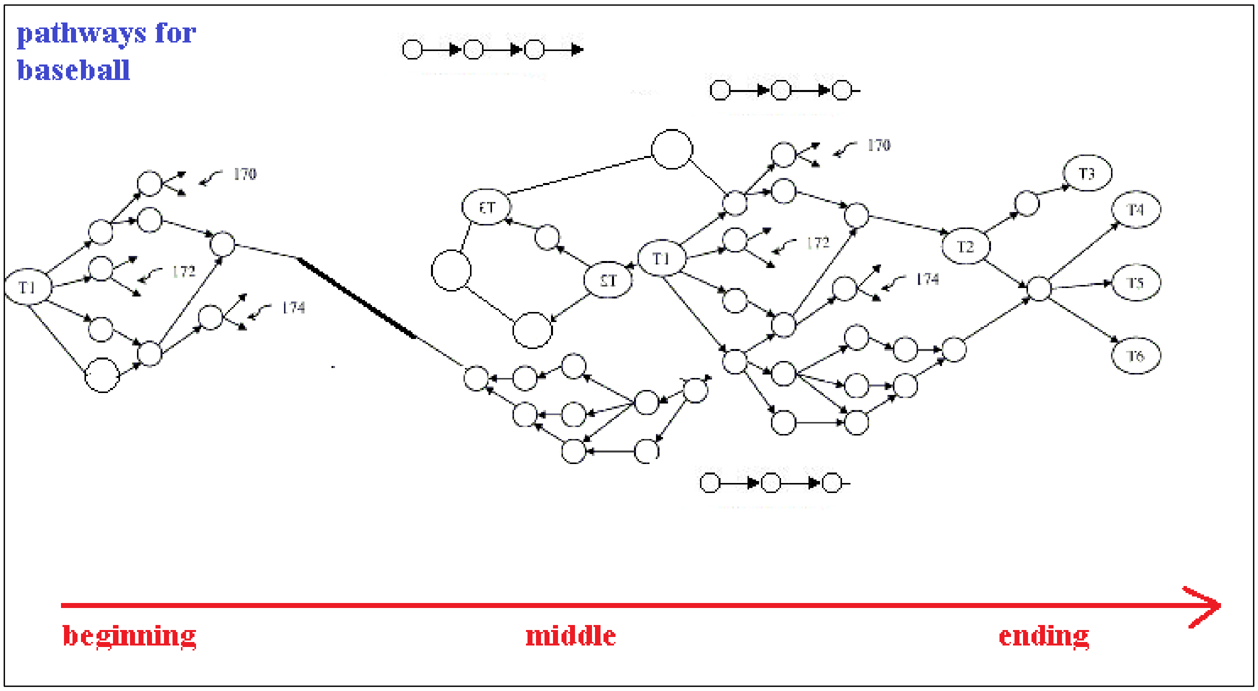
Other topics:

Pathways are clustered and stored in a timeline/s

Another important thing to remember is that in a given task, like playing baseball, pathways are stored in clusters in a timeline. Pathways are stored at the beginning, middle, and ending of a game and depending on the time of the game and situation, the robot's brain extracts different pathways. For example, at the beginning of the game, the robot will extract pathways to follow instructions from a coach. At the beginning of a baseball game, the coach will give the batting lineup and player positions. In addition, there are some rules and objectives that are given, like the batting signals and how hard to play the game.

Another example is driving a car. Pathways for driving are also stored based on a timeline. At the beginning, middle, and ending of driving there are specific rules and procedures to follow.

This is basically how my robot manages complex tasks. It uses the pathways as a way to separate individual procedures of a job. At the beginning you do this, at the ending you do this, in this situation you do that, if you're playing as the pitcher use these pathways, in multiple situations you do this, if you identify a street light you do that, etc.

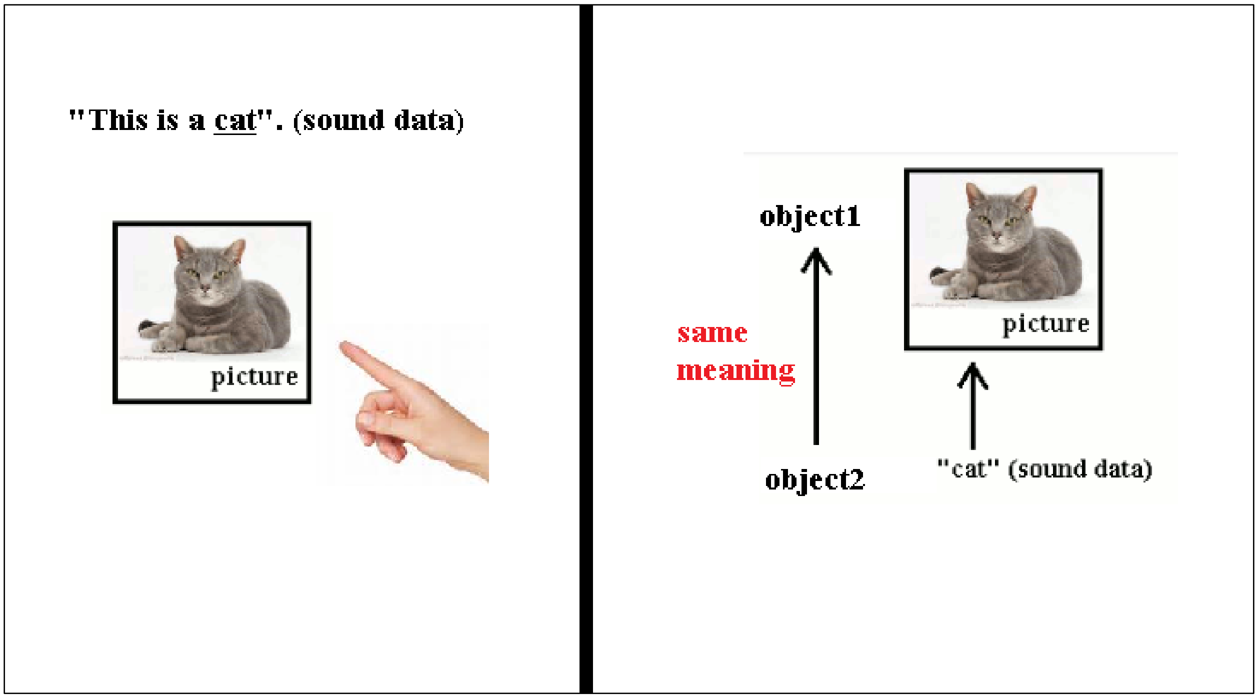


Every human task has different decision trees. And these decisions tree comprises massive forest and trees, connected or separated. These pathways can form any type of computer program or function to accomplish a task, regardless of how complex they may be. Writing software programs for Microsoft is a very complex human task and it spans all skills and knowledge. In some cases, the whole brain will light up because it is accessing information from all cognitive skills in order to do something complex like write software programs.

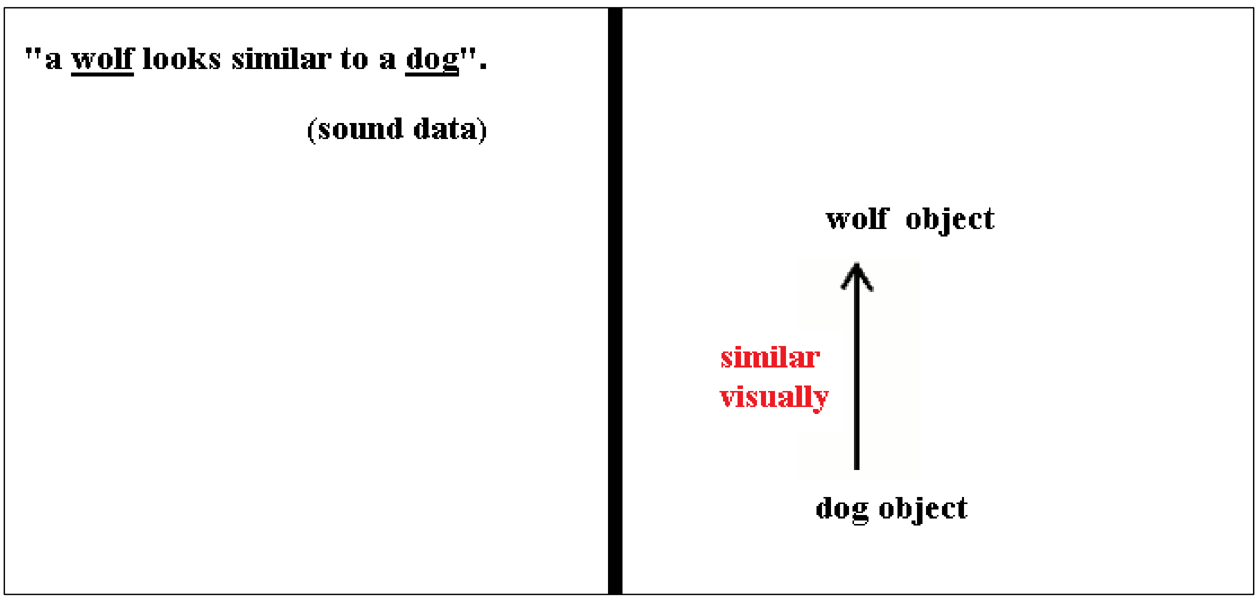
English sentences structure data into self-created semantic networks

A sentence like "this is a cat" has patterns. The pattern is, in memory, the location of the word cat and the visual image of a cat is located really close to each other. This sentence basically helps the robot to organize and create data in memory. If the robot has never encountered a dog before and the teacher points to a dog as says "this is a dog". Based on the sentence the robot's brain will create 2 objects in memory: the visual image of a dog and the sound data dog. These 2 objects will be created and stored close to each other in memory.

This is a ----



A sentence like “a wolf looks similar to a dog” also has patterns. The robot will find the patterns and attach them to the sentence structure: a R1 looks similar to a R2. In memory, the robot’s brain will establish relational links between the 2 objects: wolf and dog. The relation is that both objects are visually similar.



The point I’m trying to make is that English sentences generate self-created semantic networks in the robot’s brain. Data are organized in complex data structures based on English sentences. Decision trees are structured into decision making semantic networks. Data inside the brain establishes relational links and operations like a semantic network; and search functions are discovered on its own to search for data in these semantic networks. Even things like logical networks, decision making systems, and induction and deduction reasoning are self-created.

English sentences in pathways generate: