Outline for a Series of Advanced "Build It" Articles with the Goal of the Creation of a Truly Cognitive Android

Current robotic intelligence technology has stagnated at a point that is only slightly beyond toys and entertainment. All of the components currently exist in some form to move beyond the current state of technology to the event horizon of android technology such as R2D2 and C3PO of Star Wars fame.

The meaning of android technology is "human emulation". In other words, humans don't use a keyboard, in general, to communicate with each other face to face, but rather they accomplish this through language skills. Humans also have the ability to accumulate information and to put that information to use through cognitive reasoning skills.

The robots available to consumers and hobbyists today have extremely limited processing and storage capacity, and yet with proper engineering, this capacity can be vastly improved, which is absolutely necessary if one is to reach the event horizon of android technology.

Robotics is an inappropriate term for the technology that will be introduced in this series of "Build It" articles. Once the major portions of the processing and memory capacity have been achieved, we can begin to eliminate traditional programming in favor of human-like communication with our android.

From this point forward, we shall not refer to this series of articles as building a robot, but rather, these articles shall be "How to Build an Android".

Through these articles we will lead the reader into this limitless new horizon of the process of thought and cognition. Once this has been completed, the reader will have the skill set necessary and the platform to travel through and explore this inner space and make new discoveries on his own.

The first step is to choose a processing platform that has the most parallel processing technology available. For this I have chosen the Parallax Propeller chip which has eight independent subprocessors called cogs which allow eight simultaneous processing streams to be executed in one device.

The Propeller chip is a low cost platform and we will require up to eight of these devices which will give us a maximum of 64 simultaneous processing streams. The human brain is a massively parallel processing system, and therefore to emulate this neurobiological model, we must implement a set of parallel processors in our android brain.

The neurobiological model also has an almost limitless memory capacity which is highly integrated into the massively parallel processors. As an example, it is almost, if not impossible to know where the

processing ends and the memory begins or vice versa in the neurobiological model.

Our second major step must be the integration of large scale memory which is highly integrated into our multiple processors to form an electrosynthetic model of the neurobiological processes.

The third major step would be to design and build electrosensory systems, such as stereoscopic vision, stereoscopic sound sensory system, a vocal generation system, tactile sensory system, and ultrasonic detection system, etc.

The fourth major step would be motor systems for locomotion, arm and hand motion, and head motion, etc.

These major steps will require one or more articles each, depending upon the complexity of the major subsystem. It should be noted that each major subsystem can be scaled down to one Propeller chip each for the lowest cost processing platform to support the android technology.

Now we will start outlining each major portion.

Processing Platform – Article 1

We have chosen the Parallax Prop Proto USB Board, Parallax part number 32812 as our basic processor board due to its low cost and its Eurocard form factor, 3 inches by 4 inches. The cost is a minimal $39.95 per Proto board from Parallax and $20.00 for the KISS Debugger from Machine Intelligence Technologies.

This board is easily modified so that we can add an eight bit parallel I/O bus and two bi-directional serial I/O buses.

The board can also support up to 20 servos. Therefore, this Prop Proto USB Board can be used to implement the four major subsystems in the android technology. In other words the minimum number of Prop Proto USB Boards would be four for this android project. Eight of these boards would be needed for the full implementation of the android technology.

In this first article, we will show step-by-step how to modify the Prop Proto USB Boards for use in this project since the reader will need to make modifications to at least four of these boards in order to follow this project.

The first of these boards would be modified to implement the eight-bit I/O and two bi-directional serial buses.

The eight-bit parallel I/O bus will be used later for memory expansion and real-time binocular vision.

We will be preparing all of the boards for the final implementation. However, if the reader chose to,

they could purchase and modify one board at a time.

All of the boards will also have to be modified to generate the NTSC video and keyboard interface to support the development debugger and/or, later, the operating system.

Therefore, this first article would explain in-depth how to modify the Prop Proto USB Boards for the overall project.

As soon as one Proto board is modified, it will be capable of booting up and supporting the development KISS Debugger. In other words, the user will immediately have an interactive computer including keyboard and display for this platform as soon as the board is modified and the Debugger software is uploaded to it. This builds confidence in the user so they can proceed to the next step.

At least one Prop Proto USB Board will be modified to support both the eight-bit parallel and two bi-directional serial buses. This will allow us to go to step two with only one board operational.

Memory Expansion – Article 2

In step two, we will discuss in-depth the construction of one memory expansion board which uses the parallel eight-bit I/O bus. This memory expansion kit can be purchased from Machine Intelligence Technologies (www.machineinteltech.com).

We will explain how the memory expansion card works in detail, and the inner workings of the software drivers for the memory expansion card.

At this point, the user will be able to support the full machine operating system with file management, and a more extensive list of keyboard commands than the basic KISS Debugger.

Again, this further bolsters the confidence of the reader, to see a fully functional operating system running on their new platform.

Servo/Motor Control System – Article 3

In step three, the user must have a second Prop Proto USB Board available. We will show in detail how to modify this Propeller board to control 16 independent servos and/or motor controls. We will also discuss in-depth the theory of operation of a servo and how the system is programmed to control 16 of these devices independently.

We will discuss the design considerations of a digital servo and motor drivers.

At this point, the reader will be capable of programming and operating servos and motors on any basic robotic device.

We are not going to discuss the construction of the robotic/android platform until the next to the last article. All articles to this point will be concentrated on building an android brain platform, or you could say, the electronics to support an electrosynthetic brain.

Vision Control System – Article 4

This requires and independent Prop Proto USB Board. In this article, we will modify a Prop Proto USB Board with a 8-bit parallel and dual bi-directional serial buses for interfacing with the binocular vision sensor logic board. We will also discuss in-depth the design and construction of the binocular vision system logic and the driver software to support it.

Electrosensory Control System – Article 5

In this article, we will require a minimum of one additional Prop Proto USB Board modified with an 8-bit parallel and dual bi-directional serial buses to interface with the electrosensory logic.

We will discuss in-depth the construction of the electrosensory logic for stereoscopic sound and voice recognition, ultrasonic sensors, tactile sensors, and text-to-speech vocal logic.

A kit can be purchased from www.machineinteltech.com including all hardware and software necessary to construct this I/O subsystem. We will discuss in-depth the theory of operation of both the hardware and the software.

Mechanical Construction of the Robotic Platform for the Android – Article 6

This will be a standard physical construction article and a discussion of the final interconnection between the electronics and the motors, servos, and sensors.

Android Awakening – Phase I – Article 7

The last two articles really differentiates us from all others. These articles will be the reason readers will follow along and build the android, to see the fulfillment of the promise of an electrosynthetic brain.

This article is phase one of the loading, testing, and basic training of the android cognitive software. This will be an overall theoretical discussion of how to begin the training of the android software/hardware subsystems.

This will be a step-by-step loading of software modules into the EEPROM's for each Propeller chip. This is what we call the generation of the genetic software algorithms.

When a child is born, it has certain genetic inherent mental abilities, such as the taking of sustenance, or feeding, and inputs for tactile and auditory sensory inputs, the skin and ears. Some weeks later the

vision begins to clarify.

These are the same principles that are being put into effect during this phase of the cognitive software.

At the end of this process, the system will be capable of understanding two words, “yes” and “no” and nothing more. The theory of the basic operation will be discussed in this step-by-step awakening of the machine/android.

Android Awakening – Phase II – Article 8

The android recognizes two words in English, “yes” and “no”. From these two simple words, a complete vocabulary can be constructed. We will lead the reader step-by-step through the construction of a basic vocabulary and how to make the android learn. Then, the reader will be able to take it to the limits of its electroneural capacity, or memory storage. To gain greater capability, all that is necessary is additional memory.

We have an inherent 32-bit addressing scheme, which can be 2 to the 32nd minus one 32-bit words, in other words, in the realm of the mini mainframe.

Summary

In summary, at each step, the reader/builder will bring to life new, fun and exciting capabilities of the overall system that will become a vehicle, a ship to explore the wondrous new frontier of the inner space of abstract thought. This will give the reader a virtual lifetime of exploration.

Machine Intelligence Technologies
Leading the way in android development.
You don't program our machines. You teach them!
www.machineinteltech.com

Patti Allred, President
patti@machineinteltech.com

Mark Allred, Vice President
mark@machineinteltech.com

Machine Intelligence Technologies

Leading the way in android development. You don't program our machines. You teach them!

Dr. James O. Gouge, Chief Engineer
jim@machineinteltech.com