# Project Objectives

The objectives of this project are the following:

* Restore PeopleBot back to operational state – Given the state of the robot at the beginning of the project, this will require some mechanical assembly, as well as some investigation of the original software that the robot was purchased with. The measure of success of this task is to have the ability to connect and interface to the robot, such that commands can be sent to it from a host computer platform. This goal has been successfully attained.
* Investigate other software platforms that can be used to develop application that will implement intelligence on the robot and be able to interface with it. These applications will incorporate real-time image processing for computer vision, real-time speech recognition for implementation of interaction with human commands. This objective has been attained, and the details of the software platforms being implemented and developed are described the respective section of this report.
* Develop and implement software application that will add human interaction capabilities to the robot. These will allow the robot to have different behavioral modes, such as interaction with humans by vision and speech recognition, a self awareness mode which will allow the robot to have the freedom to wander about in a room and have the capability to avoid obstacles. This objective is still in progress.

# Hardware

The version of PeopleBot at PSU is a Pioneer 2-DX. It uses a 20MHz Siemens 88C166 microcontroller with 32KB of EEPROM (Flash) on-chip memory and an additional 32KB of dynamic RAM off-chip memory. The robot is also equipped with independent motor/power and sonar controller boards that interface with the microcontroller board.

# Manufacturer

The original manufacturer of PeopleBot was ActivMedia, which change its name to MobileRobots, and has now been acquired by Adept Technologies and changed names again to Adept Mobile Robots.

We have contacted Adept Mobile Robots and supplied the serial number of PSU’s robot to have access to the available downloads to registered robot owners, shows the details for accessing the support website and downloads for PSU.

|  |  |
| --- | --- |
| **Website** | <http://robots.mobilerobots.com/wiki/All_Software> |
| **Username** | Portland |
| **Password** | nT7>qEhy |
| **Robot Serial Number** | PBBDBB1270 |

Table - PSU's PeopleBot Accessibility Details

Some of the software that was available for controlling and developing of applications for aimplementation of intelligence for PeopleBot is no longer available. Specifically, Saphira can no longer be downloaded from the current robot manufacturer’s website.

# Firmware

The firmware package for PeopleBot is P2OS, the version currently loaded on the PSU’s robot is P2OS\_1P. The most current firmware version available for download to the robot is P2OS\_1Q.

We have attempted to updated the firmware version of the robot, but have been only partially successful, as the firmware update can be downloaded, however it cannot be saved to the EEPROM (Flash) memory of the robot. Because the robot can be operated and controlled with the current firmware version loaded on it, the team has decided to postpone the task of updating the firmware as to a later time.

# Software

Because the original software development platform that the robot was purchased with is no longer available for download from the manufacturer, it was decided that the development of applications that implement intelligence on the robot would be accomplished by using a combination of the available robot interface/control libraries available from the manufacturer and other third-party software packages. These third-party software packages were chosen based on the area of robot intelligence to be implemented, such as vision, speech recognition (list other areas of intelligence).

*ActivMedia Robotic Interface for Applications* (ARIA) is a client-based software development kit that contains a set of libraries and functions that allow direct interface and control of the robot. ARIA was developed in C++. We are using ARIA as the basis for our low level development of a program that will allow all other applications implementing intelligence to interface with robot, such that movement and motion commands can be sent to the microcontroller for execution and status can be retrieved back from peripheral devices such as the sonar arrays and motor encoder feedback.

*OpenCV* is being used to implement the vision interface of the robot; this is a set of library functions that allow the development of applications for real-time image processing. The application being developed to implement vision on the robot will run on a dedicated host computer separate from the PC that will be running the remaining intelligence applications.

A.L.I.C.E (Artificial Linguistic Internet Computer Entity)- Its open source version Program D, written in Java, is being used for implementing natural language processing. It uses AIML, a type of XML, for storing and retrieving its language model. Speech reorganization is incorporated with it to provide real time chatting capability to the robot. Also the program is customized to learn new information on the fly, execute system commands or respond to user query via gesture.

CMU Sphinx is used for the speech recognition. It is open source and written in java and provides with a very flexible acoustic model and language model that can be easily extended using a XML configuration. Also the speech recognizer provides large vocabulary continuous word recognition capabilities. The accuracy for the default models is in the range of 48-55 %.

**Architecture:**