Java GPS

Christian Doyle cldoyle@gwu.edu

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1 Abstract

In this project I will create a Java powered GPS device which will 'talk' about it's current location. The device will consist of a Gumstix basix motherboard, GPSstix expansion board, a standard passive GPS antenna, and head phones. The hardware will be controlled by the JamVM virtual machine and a number of custom libraries and use case software written specifically for interacting with the gumstix's GPS module. The use case software will also interact with the on board audio to tell the user the current coordinates of the device.

2 Strategy

2.1 Platform

The core of this project will be the Gumstix basix motherboard. The basix has a 200 MHz Intel X-Scale processor and 64 MB of SDRAM. The basix will be enhanced with 512 MB of SD memory which will (hopefully) be enough space for all of the required software and files.

2.2 Capabilities

The basix will be connected to the GPSstix by way of the 60 pin IO port on the basix motherboard. The GPSstix has a power jack on it, when powered by a 5 volt adapter it will supply enough power to its self, the motherboard and any peripherals. The GPSstix also has a USB port and the basix has USBnet. Using these I will be able to use ssh and scp to connect to and copy files to the motherboard respectively. The GPSstix also features audio in and out which can be used to record and play sounds respectively. And of course it has a GPS module which will report data about the location of the device.

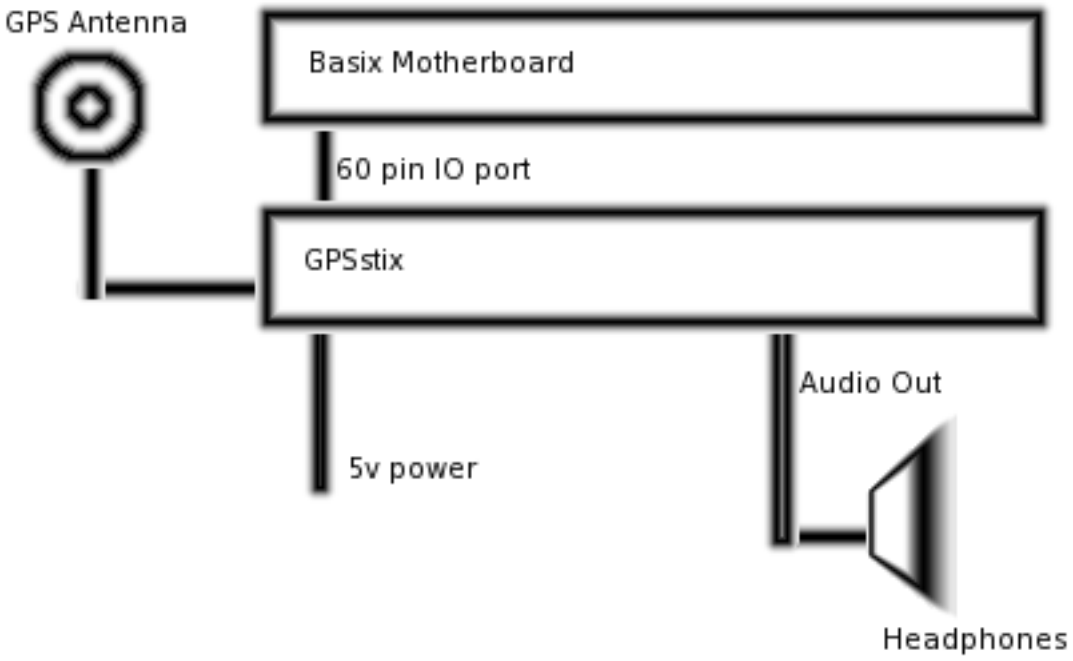
2.3 Software Modules

The software will be driven by JamVM backed by the GNU classpath. There will be three main software modules. The first will parse data from the GPS.

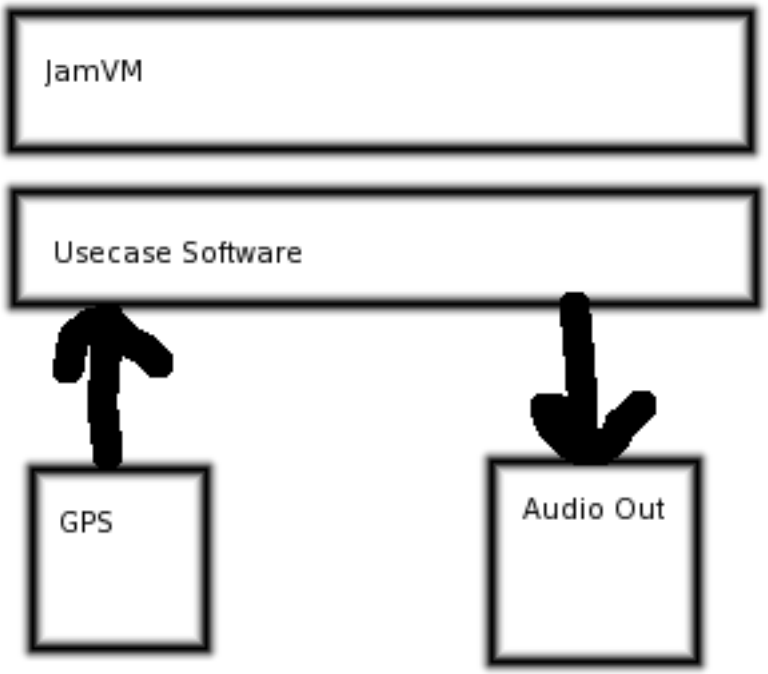
This will work by either making JNI calls or by executing commands in the runtime environment. The second will load WAV files. Finally the third will send the data in the WAV files to the audio out either through JNI calls or runtime environment calls.

2.4 Main Loop

The software will parse data from the GPS, then will play WAV files on audio out so as to create sentences that tell the user about the current longitude and latitude of the device.



2.5 Hardware interaction diagram



2.6 Software interaction diagram

3 Unknowns

I am not completely certain if I will be able to compile JamVM or the GNU classpath using the IDE, I might have to use a gcc crosscompiler. I have had problems compiling cross compilers on my machine before so I would prefer not to do that.

I am also concerned that the basix will not have enough RAM to run JamVM well. It has 64 MB, but I am still not sure if that will be enough to get good performance out of a JVM.

There is also a concern (though not a big one) that 512 MB of flash will not be enough. JamVM and the GNU classpath take up quite a bit of space. Also WAV files take up quite a bit of storage space, so flash space might become an issue.

I am not completely certain about how to interact with the GPS device. The gumstix does have software for interacting with the GPS device I'm just not sure of all of it's capabilities.

As of today I do not know where I am going to get a microphone to record sounds. I would prefer not to buy one but I might need to if I have no other choice.

I also do not know how to play WAV files in Java. But I am sure that there is a library that will decode them for me. So I can avoid the mess of writing libraries to decode WAVs.

4 Implementation Plan

- Order all of the hardware from gumstix (motherboard, GPSstix, SD memory, and power adapter)
- Assemble the set and verify that everything works
- Familiarize myself with the IDE and embedded Linux
- Write some simple programs using the IDE
- Familiarize myself with the GPS module
- Verify that I can read data using the built in software
- Compile JamVM and GNU classpath
- Write some simple Java applications
- Write libraries for interacting with the GPS module
- Record WAV files for use by the software
- Write libraries for interacting with audio out
- Complete the use case software

Date	Goal	Unknowns
2/19/07	Order Parts	none
2/26/07	Assemble hardware, verify that it works	none
3/05/07	Get familiar with IDE and embedded Linux, write some simple programs	none
3/12/07	Interact with the GPS, be able to get data about location	Interacting with the GPS may be a problem, the gumstix wiki has a wealth of information on the topic but I have yet to thoroughly research it
3/19/07	Compile JamVM and the GNU classpath, write some simple java applications	Not sure which compiler I will need, I will try to cross compile gcc first, if that does not work out I will try the IDE
3/26/07	Write libraries for interacting with GPS	none
4/02/07	Record WAV files	Where to borrow/get microphone, may need to buy one :(
4/09/07	Complete software	Playing WAVs could be a problem, but there is probably a Java library out there to do it
4/16/07	Buffer in case I fall behind	none
4/23/07	Thoroughly tested and working, write paper	none

5 Resources

Hardware:

- Gumstix basix motherboard - purchase from gumstix web page
- GPSstix - purchase from gumstix web page
- 512MB mmc memory - purchase from gumstix web page
- 5v power adapter - purchase from gumstix web page
- Headphones - I already have several pairs
- USB cord - I already have one
- Passive GPS antenna - Radio Shack (if they have one), Internet if not

- Microphone - Borrow (if I can find somebody who has one), buy if not

Software:

- JamVM - jamvm.sourceforge.net
- GNU Classpath - gnu.org/software/classpath
- Gumstix IDE - http://docwiki.gumstix.org/