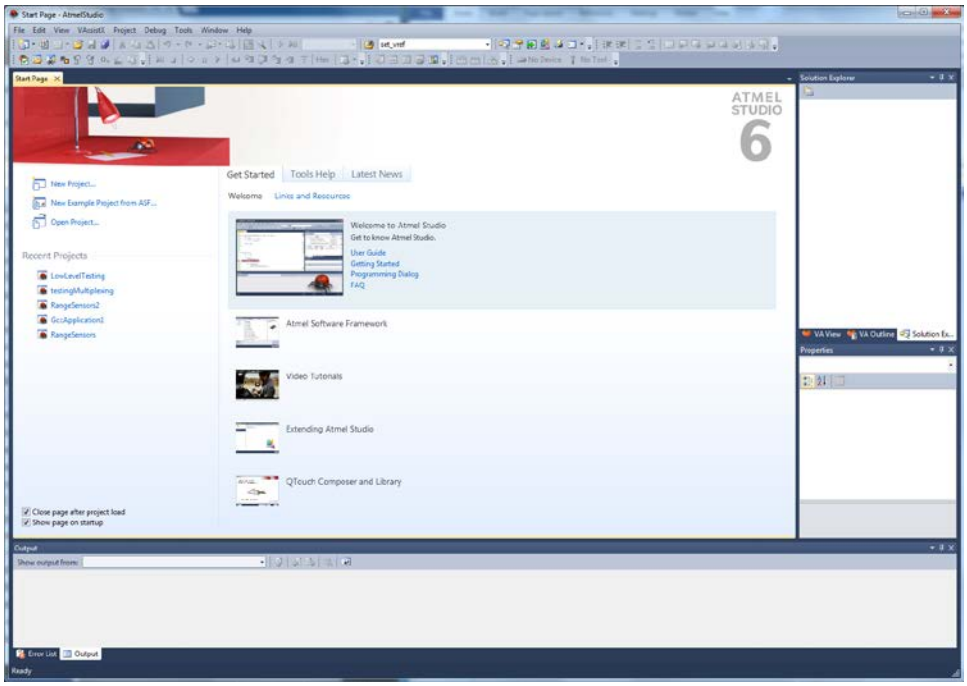
Setting up Atmel Studio and Programming CEENbot

Introduction

This guide will walk you through downloading the software necessary to program your CEENbot, creating your first project, called “Hello Dolly”, and loading it to the robot. While setting up this project, it is suggested you record the file paths and other information on the CEENbot Setup Checklist.

Installing Atmel Studio and WinAVR GCC toolchain

In order to program the CEENbot, we will be using Atmel Studio 6.0, which can be downloaded here (note: you will be asked to give your name, email address, and affiliated company before proceeding to the download page). The opening screen will look like this:

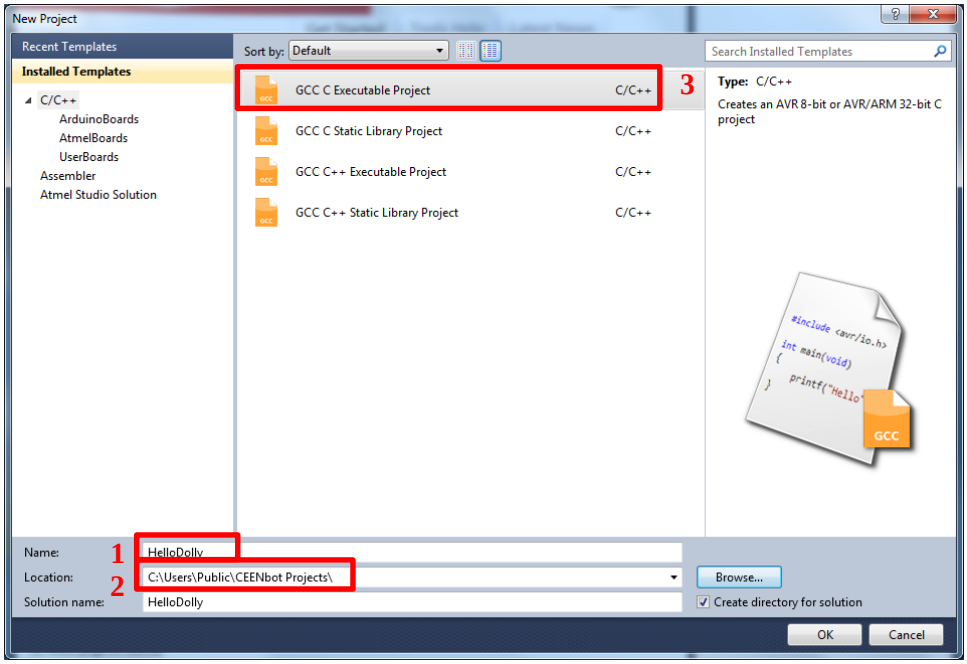


Next, you will need to download the WinAVR tool chain to a memorable location on your computer. The tool chain is downloaded as a .exe file from here. Running the .exe file will download a number of API library and header files. You will also need to download the following CEENbot specific libraries here, which are included in a file called **lib-includes**, and a static library (libcapi324v221.a). You will need to provide the locations of the WinAVR, **lib-includes** folder, and the static library to Atmel Studio.

You are now ready to start your first project.

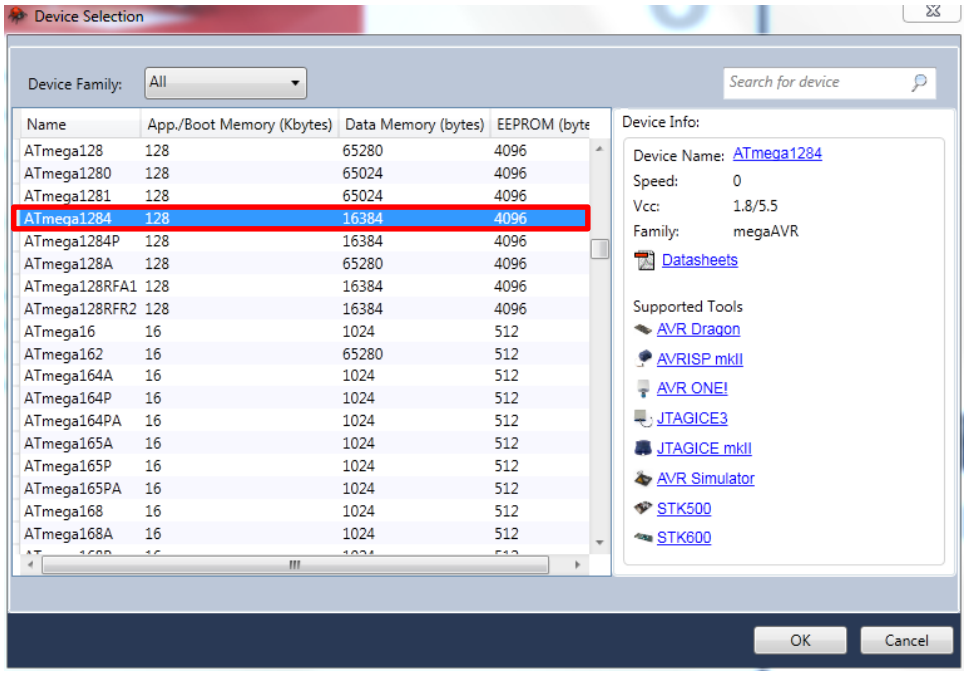
Creating a new project

To start a new project, go to **File→New→Project…** This will bring up the following window:



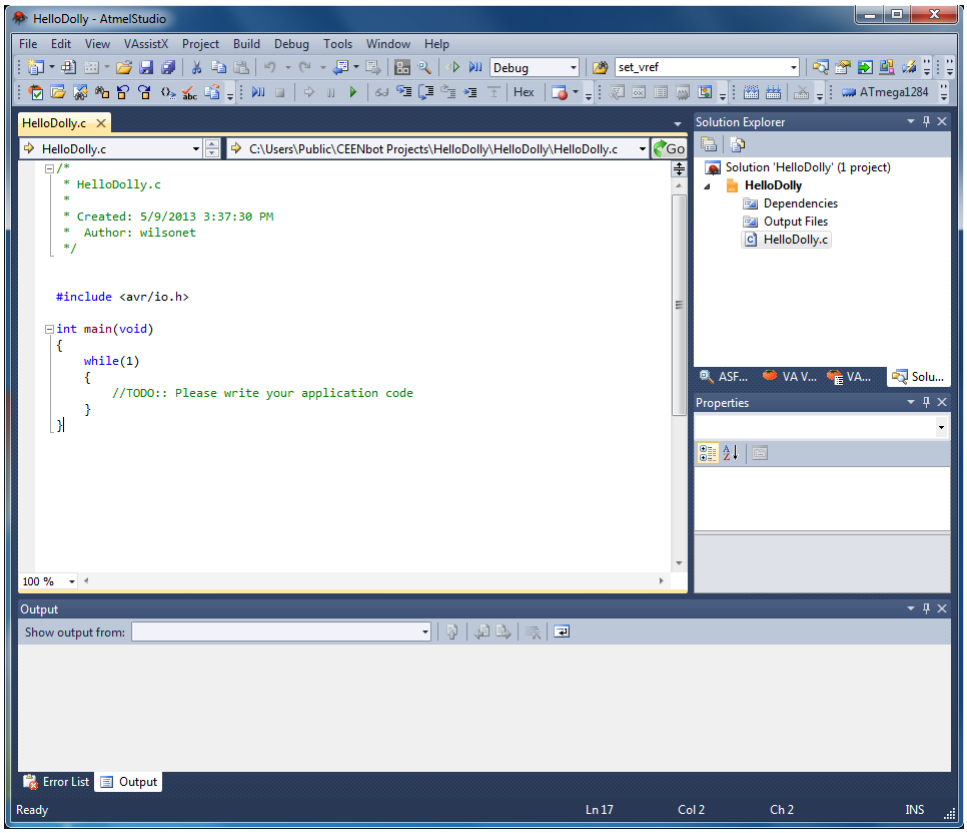
At this page, you will want to give the file a name and a location to save the project to. The Solution name will fill itself out based on the contents of the Name field. Make sure that GCC C Executable Project is selected. Click **OK**.

At the next window, you will select the PIC you will be programming.

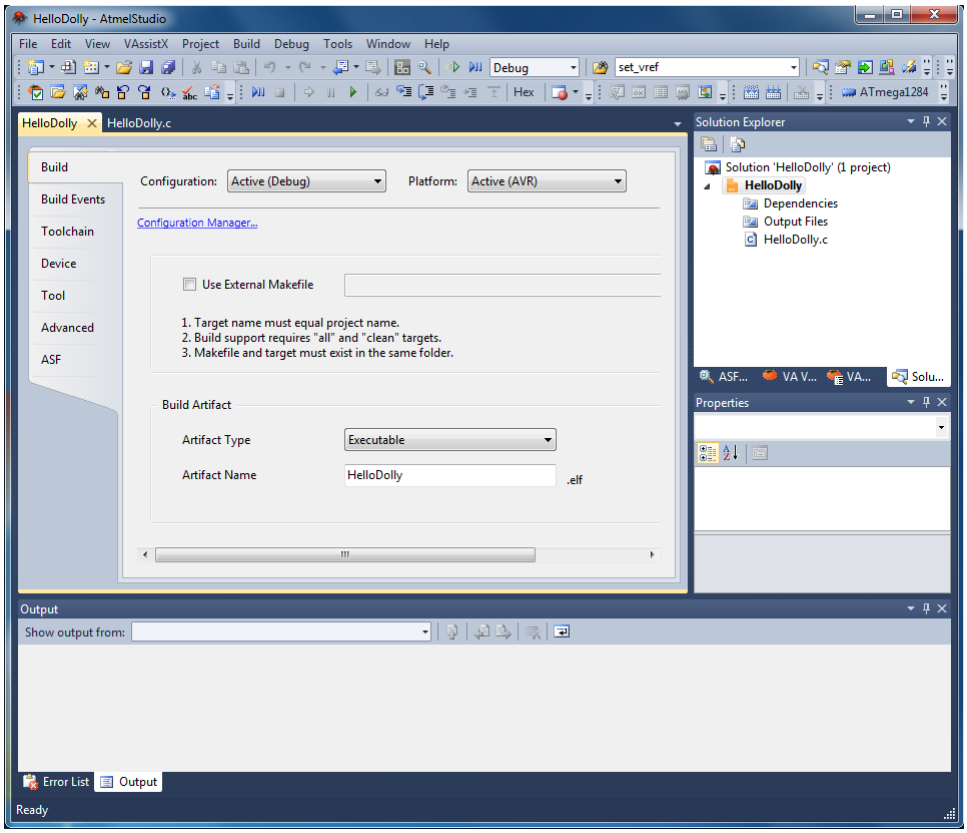


The CEENbot uses a PIC microcontroller to run the robot. The PIC will either be the ATmega1284 or ATmega324P. From the list, make sure you select the correct PIC for your robot (The project may still operate if you select the wrong chip, but there may be some unpredictable errors). Click **OK**.

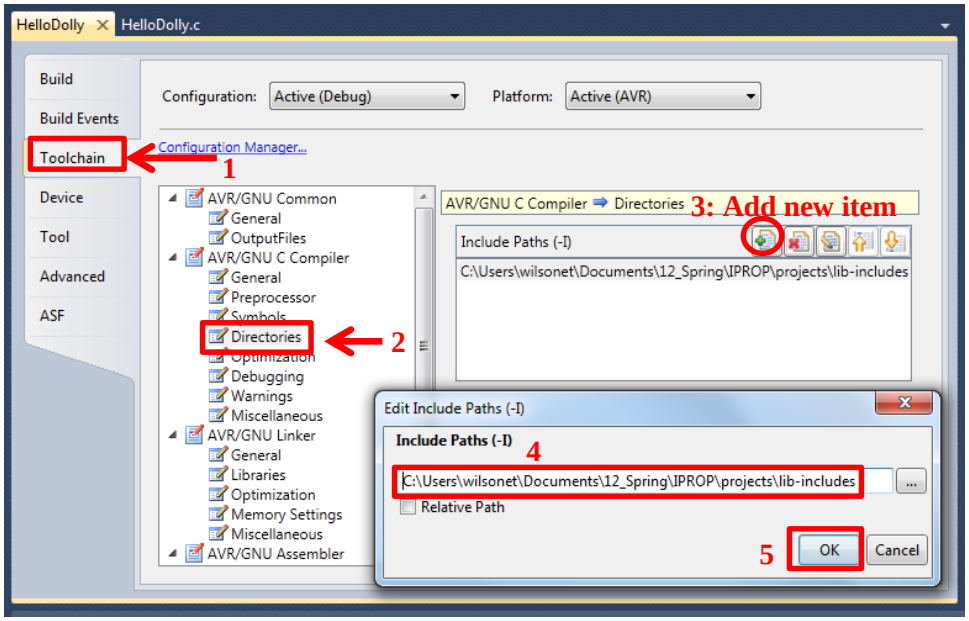
The program will open the editor with the C file for this project open. You will need to edit this file in order to control the robot.



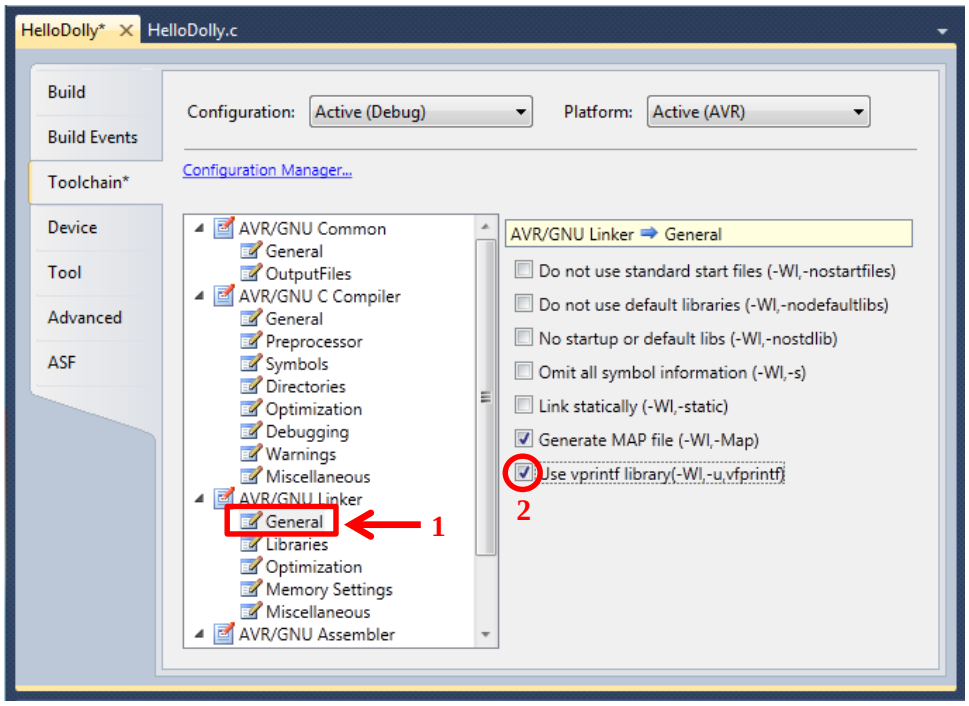
But before you proceed, you will need to provide Atmel Studio with the location of the header and linker files you will be using. To do this, go to **Project→[Project Name] Properties…** This will open the following file in the editor:



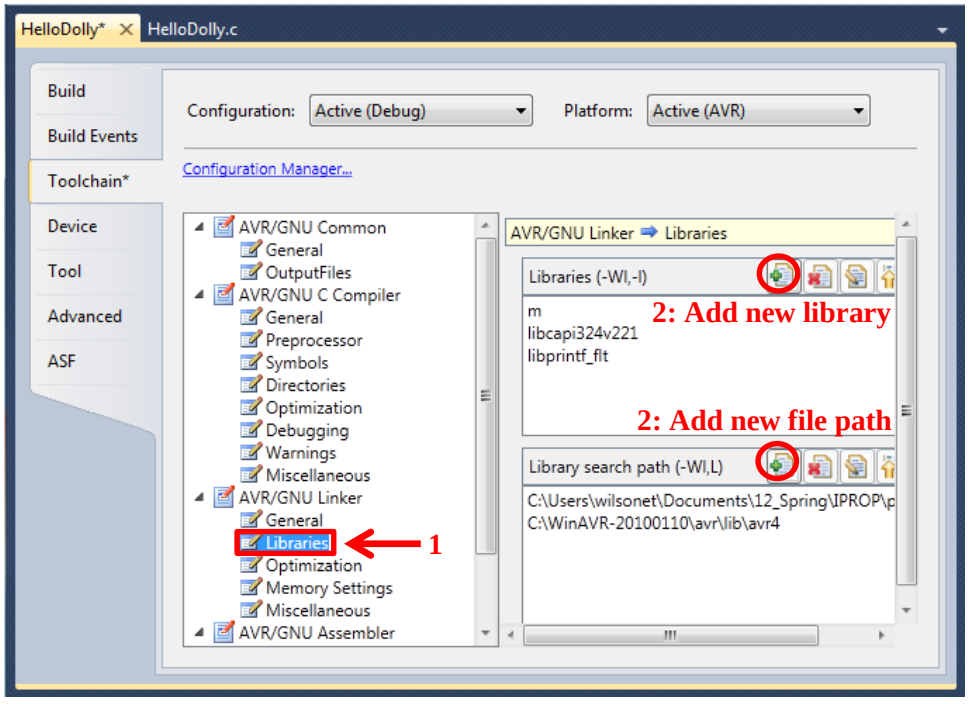
The items we will be editing are located under the **Toolchain** tab. First, go to **Directories (**under **AVR/GNU C Compiler)** and add the path to the **lib-includes** folder (..\lib-includes).



Next, go to **General** (under **AVR/GNU Linker**) and select Use vprintf library(-Wl,-u,vprintf). This will allow the use of several functionalities, notably print functionality.



Add additional libraries by going to the **Library** tab (under **AVR/GNU Linker**). Add the paths to the libcapi324v221.a static library and **lib-includes** folder in the Library search path (-Wl,L) section. In the Library section add *m*, *libcapi324v221*, and *libprintf_flt*. The *m* and *libprintf_flt* libraries are both contained in the **lib-includes** folder. The *m* library will allow for special math functions. The *libprintf_flt* library will allow us to print floating numbers.



Make sure that after you make these changes, you save the changes (Ctrl+S will suffice). You can now begin loading programs to CEENbot.

(NOTE: if you selected the wrong PIC type or need to program to a robot with a different type of PIC, this can be changed in the **Device** tab [**Device→Change Device…**]. This will bring up the window that allowed you to choose your device when you first created the project)

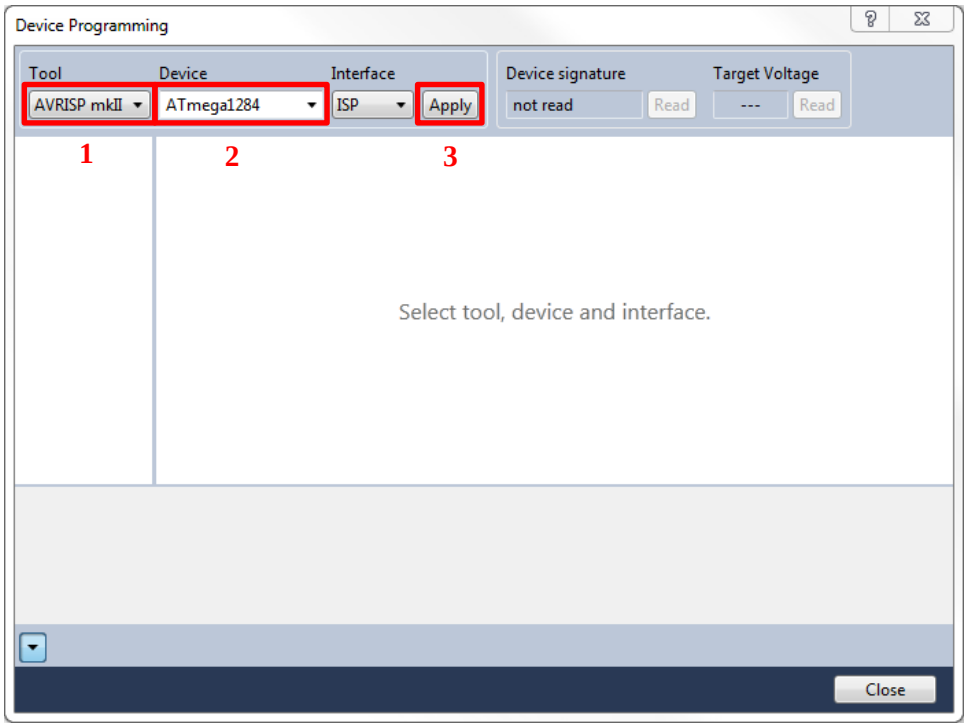
Programming your CEENbot

In the C file that opened upon the creation of your project, paste the following code:

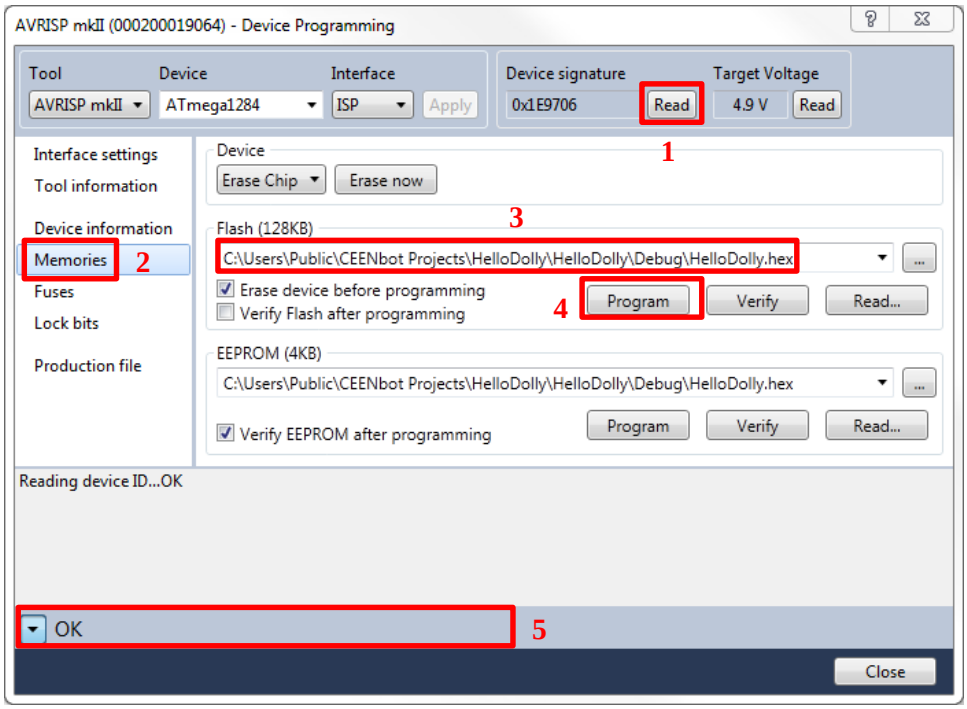
```
#include "capi324v221.h"

void CBOT_main(void)
{
     LCD_open(); //allows use of the LCD
     LCD_printf("Hello, Dolly!"); //print to the LCD screen
     while(1)
     {
          //do nothing!!!
     }
}
```

This will do nothing more than print the message “Hello, Dolly!” to the LCD screen mounted on the CEENbot.

Once this code has been copied, go to **Build→Build Solution** (shortcut **F7**). If the build was successful, you may now load the project to your CEENbot. Connect the programmer to your computer and the CEENbot. In Atmel Studio, go to **Tools→Device Programming**. The following window will then appear:



In this new window, check that the tool selected is the AVRISP mkII and the device is appropriate for your CEENbot. Press **Apply**.



If the programmer is connected to your computer, this window will be filled with fields and buttons. First, press **Read** under the Device signature. If the programmer is properly connected to the robot, the field to the left of the button will be filled with data. Next, go to the **Memories**

tab. In the Flash (128KB) field, select the file path leading to the hex file for the project. By default, this will be in the Debug file of the project file. Press **Program** to load the program onto the robot. Upon completion uploading the program, the field at the bottom of the window will be replaced with the new message “Programming Flash …OK”.