
Flashing Modelica Code to and Arduino using MDD

FOSSEE, IIT Bombay

April 25, 2018

1 Introduction

This document has been written with the intent of familiarising a user with the aspects of the Modelica Device Drivers (MDD) package that allow one to flash OpenModelica code directly to an Arduino.

This article will briefly cover the usage of the Embedded Targets subpackage within Modelica Device Drivers package and will then detail a specific example.

2 Usage

MDD consists of a variety of ways of communicating with external devices, but one of its most powerful utilities is the ability to create flashable C files for AVR and STM microcontrollers. This allows users with little experience in AVR C to code instructions to the microcontroller. While the steps for this haven't entirely been integrated within OpenModelica itself, they are fairly straightforward and with the usage of an example, we will explain them below.

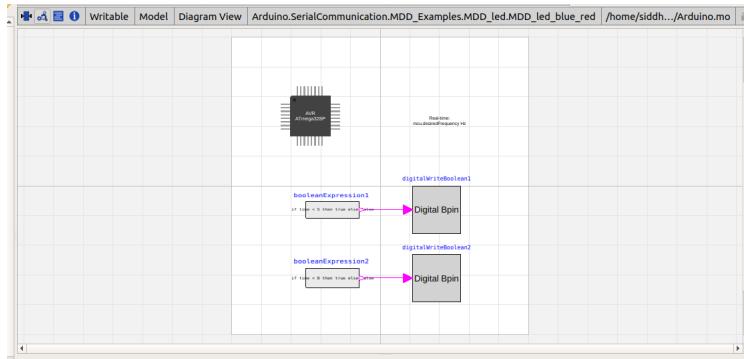
Before we begin, we will need the following tools. This doc assumes that the user is using a linux based system. If the user has Ubuntu installed, they should run the following commands to install the relevant tools for the task.

- sudo apt-get install gcc-avr
- sudo apt-get install avr-libc
- sudo apt-get install avrdude

The experiment being done is that of turning an LED on with two different colours within a 10 second interval. The shield being used for this looks as given below:



The model that will be uploaded looks as given below:



Next, we create a .mos file for the problem at hand. As we mentioned before, we can't directly flash the model to the arduino, so we will be doing it via the terminal. The first step involves creating a .mos file that will load the relevant files in memory and then translate the model into a C file. A generic .mos script is shown below

```
loadModel(Modelica);
getErrorString();

loadFile("/home/[path to Modelica_DeviceDrivers]/Modelica_DeviceDrivers/pac
getErrorString();

loadFile("/home/[path to the package containing the example]/package.mo");
getErrorString();
```

```
translateModel(package.subpackage.example, fileNamePrefix="[file_prefix_of_"
getLastError();
```

After the file is created, execute the following steps. Since the example we are using here is called led_blue_red, that is the name we are going with in the steps.

- `omc -simCodeTarget=ExperimentalEmbeddedC runMDD_led_blue_red.mos`
- `avr-gcc -Os -std=c11 -ffunction-sections -fdata-sections -mmcu=atmega328p -DF_CPU=16000000UL -WI,-gc-sections led_blue_red_main.c -o led_blue_red -I /path_to_MDD/Modelica_DeviceDrivers/Resources/Include -I /usr/include/omc/c`
- `avr-objcopy -O ihex -R .eeprom led_blue_red led_blue_red.hex`
- `avrdude -F -V -c arduino -p ATMEGA328P -P /dev/ttyACM0 -b 115200 -U flash:w:led_blue_red.hex`

On doing so, the LED on the shield will light up, first with a bluish colour and then with a red colour as shown in the image below.

