MIAC Electronic Door Lock

by Jonathan Woodrow, November 2010

Abstract

Most enthusiasts will tell you that looking after reptiles is a challenging, but rewarding experience, one challenge to overcome is maintaining a reptiles environment as conditions like temperature and moisture levels need to be monitored. With this article we are shown how using the MIACs many inputs and outputs we can monitor the environment for multiple reptile tanks at a fraction of the cost of a dedicated device.

Requirements

Software:

- Professional or MIAC licence of Flowcode v3 or v4 for PIC.

Hardware:

- MIAC device
- Vellweman dimmer circuit

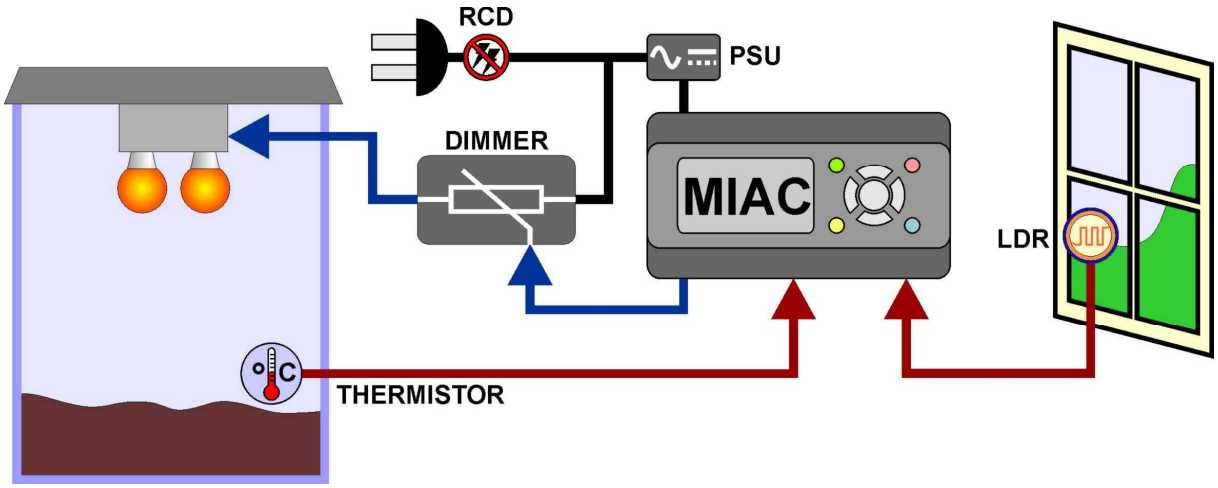
I have been a reptile enthusiast for some time now, and one of the things that is always a headache with keeping reptiles is the amount of constant maintenance of the vivariums (vivs) that is necessary.

Being introduced to Flowcode and the MIAC, the possibility presented itself to automate some of this work in the form of an environmental control system. The reptiles need constant heat in the vivs and maintaining an accurate climate while adjusting for night/day can be awkward, not to mention sea-

Photo of one set of vivs in my front room

What I am aiming for this article is something that:

• Keeps the correct temperature in the viv by using heat bulbs
• Responds to light changes, so will drop the temperature at night
• Allows me to manually adjust the temperature quickly and easily
• Gives me a simple readout of the inputs and outputs so I can diagnose any problems



Typical layout of heat and light with sensors

First job was to source the equipment. A MIAC would act as the 'control hub' of the setup providing analogue inputs and output as well as a readout.

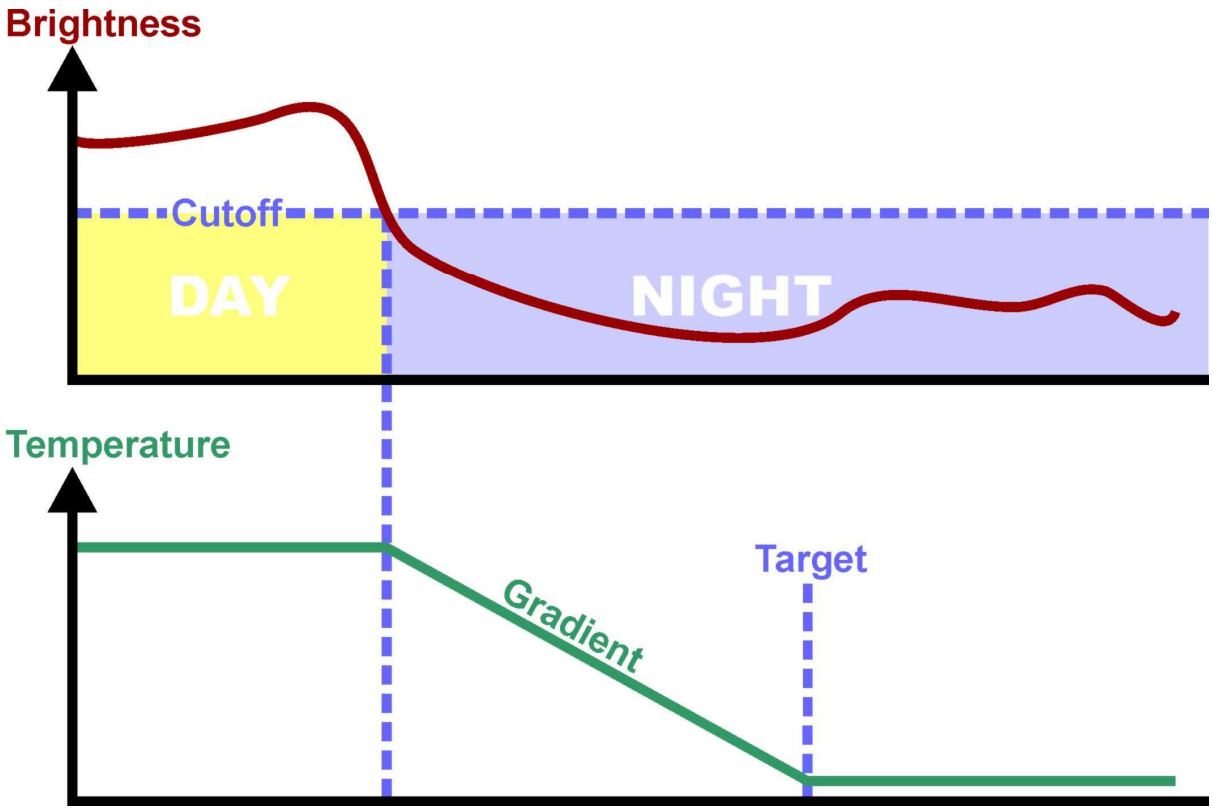
To connect this to the mains, a Velleman dimmer circuit was found, and bought, online, at a cost of around £20. This came in kit form and had to be soldered up which took a little over half a day for me to do - luckily when it was powered on and inevitably didn't work first time it was only due to a missing jumper and started right up after that.

Soldered up dimmer circuit

As inputs, I required something to judge light (LDR), something for temperature (thermister) and something to help adjust settings. Luckily the MIAC has a control panel on it so I was able to adjust settings via a menu system.

I started experimenting with the LDR to get a smooth value as I didn't want sudden glitches – a cloud passing over the sun or a fluctuation in the thermister - to suddenly 'spike' the heat source, so I opted for a moving average filter. I wanted one filter per input and I added this as C source to Flowcode with macros to enable addition of data to each filter, and to output the average and total number of elements per filter. Each input sample is taken once per timer-tick and added to a corresponding 128-element filter.

With that sorted and basic output of values via the MIACs LCD I started to look at the logic. What I would like is something simulating a smooth temperature gradient with a drop at 'night time'.



Temperature gradient

The LDR should act as a 'cut-off' - when the light drops below a certain value (say around 50%) assume night time. In this case I would like to drop the temperature by about 10 degrees, but the graph above still holds for both cases, only the ‘target’ changes.

So the options I look like I need are:

- Light threshold to cut off below
- Gradient range
- Temperature
- Temperature drop at night

I implemented a menu system allowing each one of these settings to be manually adjusted between in-built maximum and minimum values. These then needed to be applied to the input readings in order to derive an output.

The logic implemented in Flowcode for this is:

- Get temperature target
- Drop by night value if LED below threshold
- If thermister is less than target minus gradient range set brightness to full
- If thermister is above the target then set brightness to zero
- If thermister is between ranges, graduate over the range between 255 and 0

The complete Flowcode file implementing the moving average, menus and dimmer logic is provided with this article.

In addition to the dimmer, the Flowcode given here saves settings in EEPROM and toggles relays based on the brightness, one is on during 'day' and the other is on during 'night', allowing sun or moon lamps to be connected on the same timing as heat lamps. The relays aren't connected yet but hopefully will be soon.

All that was then needed was to hook all this up to the reptiles' viv and adjust the settings for the right environment for them.

MIAC run control

Contented hornet

Further reading

Below are some links to other resources and articles on related subjects, and technical documentation relating to the hardware used for this project...

Flowcode:	http://www.matrixmultimedia.com/flowcode.php
MIAC:	http://www.matrixmultimedia.com/miac.php
Learning Centre:	http://www.matrixmultimedia.com/lc_index.php
User Forums:	http://www.matrixmultimedia.com/mmforums
Product Support:	http://www.matrixmultimedia.com/sup_menu.php