Monitoring home energy usage with the micro:bit

Developing the Programmable System

Design Brief

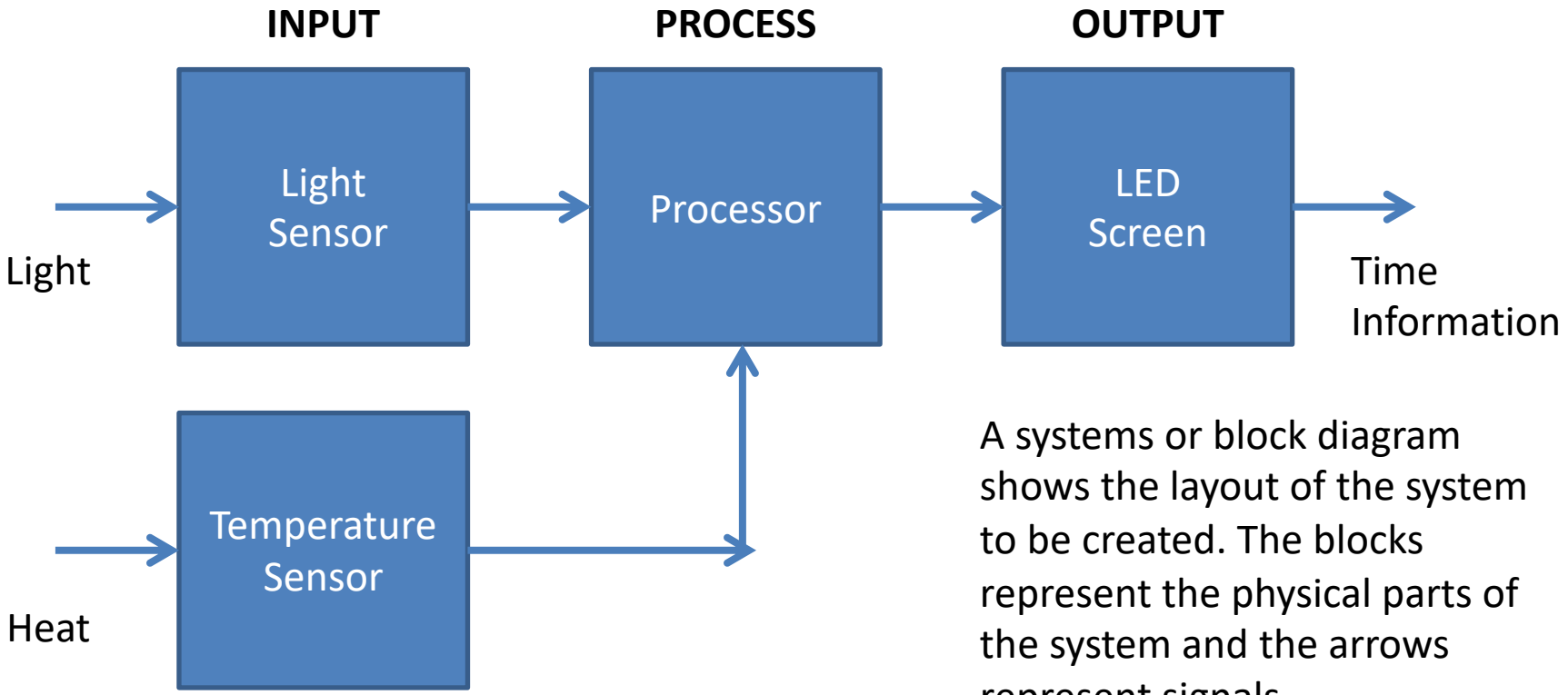
Situation

- Reducing energy usage in the home saves money, increases energy security and reduces the need to burn unsustainable fossil fuels. The first step in doing this is monitoring how much energy is used each day.

Brief

- Using the micro:bit, develop a prototype for a home energy usage monitoring system that will inform people how long they leave their lights and/or heating on during the day. Your system must use suitable input sensors to collect the data needed.

Systems Diagram



A systems or block diagram shows the layout of the system to be created. The blocks represent the physical parts of the system and the arrows represent signals.

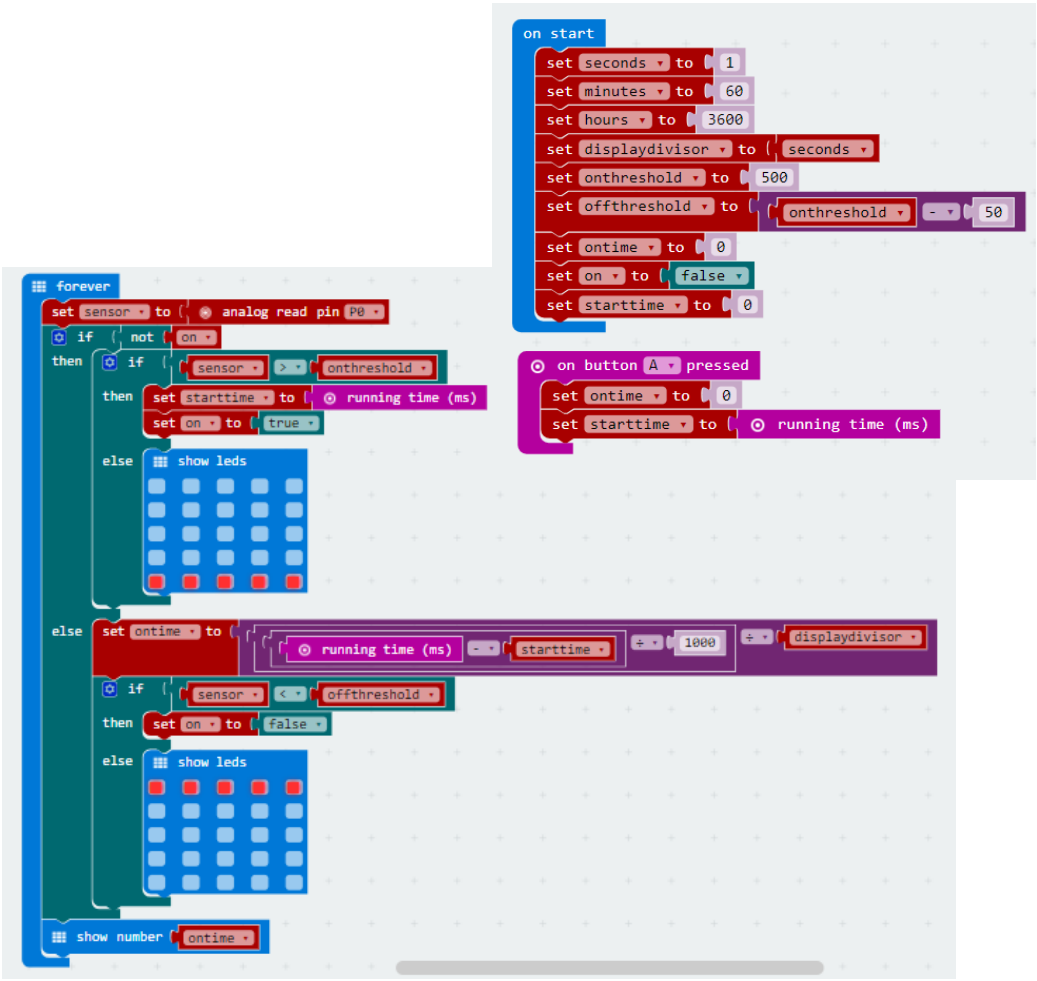
Design Criteria

The proposed system must:

- Be programmable using the micro:bit.
- Use suitable sensors to detect when how long heating and lighting are left on for during the day.
- Calculate the time that the heating and/or lighting is on for at home during the day.
- Use the micro:bit's LED screen, or another suitable output device to display this information.

Time to Develop your Program!

- Your device must be **programmed.**
- Your program must meet the needs of the **design brief** and the **design criteria.**
- You can program your micro:bit using either the **JavaScript Blocks Editor** or **Python Editor.**
- An **example program written in each** has been given to help get you started.
- Go to www.microbit.org/code to begin!



Example Program – JavaScript Blocks Editor

- Go to www.microbit.org/code and open the **JavaScript Blocks Editor.**
- Drag the file **microbit-energyuse-jsb.hex** onto the work area.
- This program will display the **amount of time** that a sensor attached to **pin 0** is **'high'.**
- Test it, download it and **experiment** with how it works!

```
from microbit import *

SECONDS = 1
MINUTES = 60
HOURS = 3600
OFF = Image("00000:00000:00000:00000:99999")
ON  = Image("99999:00000:00000:00000:00000")

display_divisor = SECONDS
on_threshold = 500
off_threshold = on_threshold - 50
on_time  = 0
on = False
start_time = 0

while True:
    if button_a.was_pressed():
        on_time = 0
        start_time = running_time()

    sensor = pin0.read_analog()
    if not on:
        if sensor > on_threshold:
            start_time = running_time()
            on = True
        else:
            display.show(OFF)
            sleep(400)
    else: # on
        on_time = int((running_time() - start_time) / 1000 / display_divisor)
        if sensor < off_threshold:
            on = False
        else:
            display.show(ON)
            sleep(400)


    if on_time < 10:
        display.show(str(on_time))
    else:
        display.scroll(str(on_time))
    sleep(400)
```

Example Program – Python Editor

- Go to www.microbit.org/code and open the **Python Editor.**
- Drag the file **energyuse.py** onto the work area.
- This program will display the **amount of time** that a sensor attached to **pin 0** is **‘high’.**
- Test it, download it and **experiment** with how it works!