Drought in Africa - Smart Irrigation System Example Program

for TI-Nspire CX OS 4.5

Texas Instruments

Background: Example Program

```
Prgm
Send "CONNECT LIGHTLEVEL 1 TO IN 1”
Send "CONNECT DHT 1 TO IN 2”
Send "CONNECT MOISTURE  1 TO IN 3”
Send "RANGE LIGHTLEVEL 1 0 100”
Send "RANGE MOISTURE 1 0 100”
Send "CONNECT ANALOG.OUT 1 TO OUT 1”
© ANALOG.OUT 1 is the object that sets the power level of the
MOSFET and the speed of the pump

Disp "Warming Up Sensors!”
temperature:=-273
While temperature<-270
Send "READ DHT 1 TEMPERATURE”
Get temperature
Wait 1
EndWhile
DispAt 1,”Sensors ready”
```

```
For n,1,50
  Send "READ LIGHTLEVEL 1”
  Get light
  Send "READ  MOISTURE 1”
  Get moisture
  Send "READ  DHT 1 TEMPERATURE”
  Get temperature
  Send "READ  DHT 1 HUMIDITY”
  Get humidity
  DispAt 3,"T=",temperature
  DispAt 4,"H=",humidity
  DispAt 5,"L=",light
  DispAt 6,"M=",moisture
  Wait 1
  If light<10 and moisture<5 Then
  Disp ”Good condition to pump”
  Send “SET ANALOG.OUT 1 128 TIME 3”
  Else
  Disp “Not a good condition to pump”
  EndIf
EndFor
EndPrgm
```

Some possible challenges/tasks

- Have the students create the code to determine if the DHT sensor is warmed up or not.
- Have the students try simple If-Then-Else statements for determining the best conditions to pump
- Have the students create decision statements that incorporate multiple sensors using *and* and *or*.
- Incorporate light level, moisture, temperature and humidity into the decision to set the pump or not.
- Discuss and try different threshold values for the best conditions to pump or not.
- Try the pump at different levels (0-255) (and observe interaction with the soil)
- Try different patterns for pumping the water (trickle, pulse,…)
- Can you restructure the program to use a While loop with a way for you to stop the program instead of a For loop.
- …

Background: Example Program

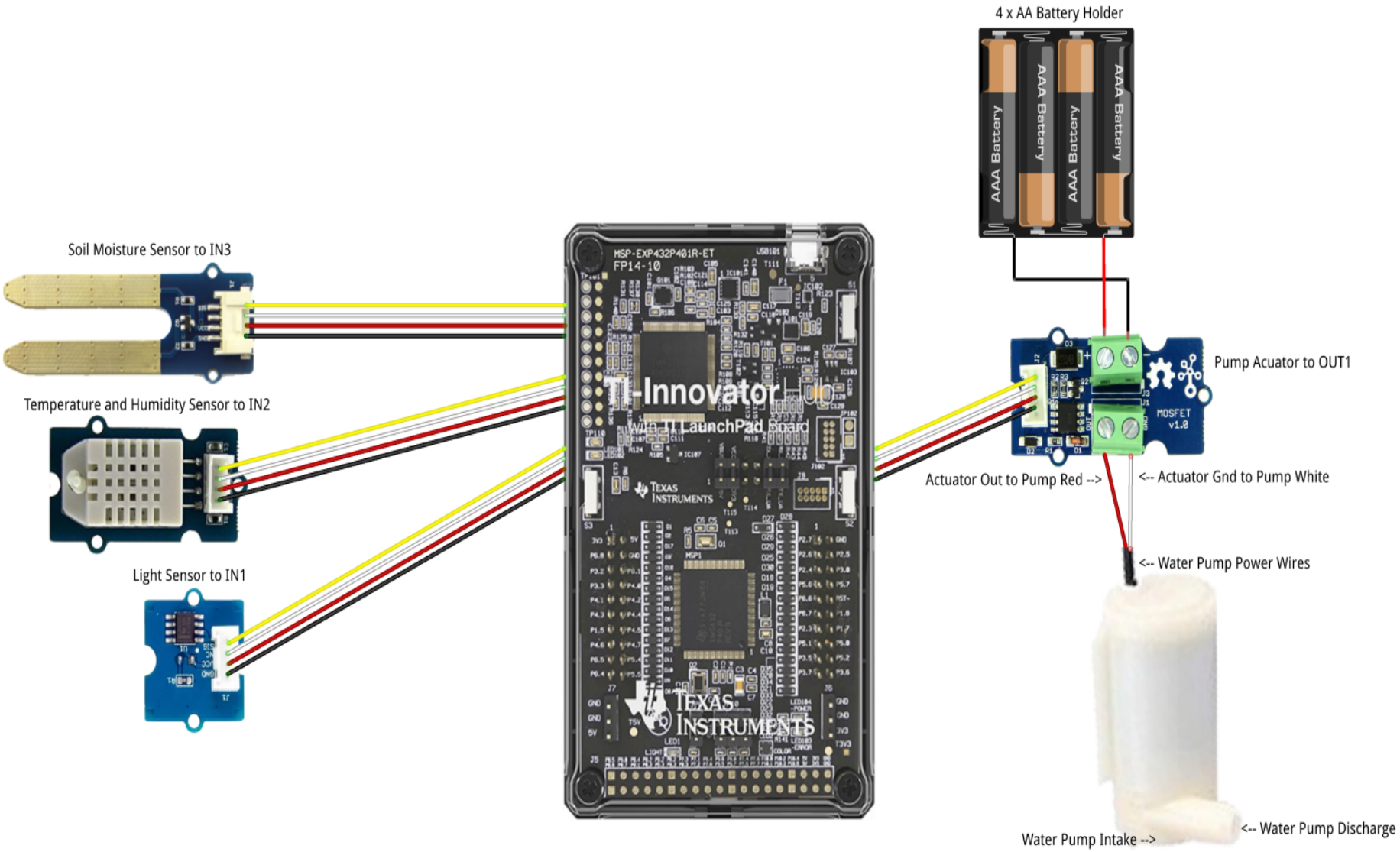
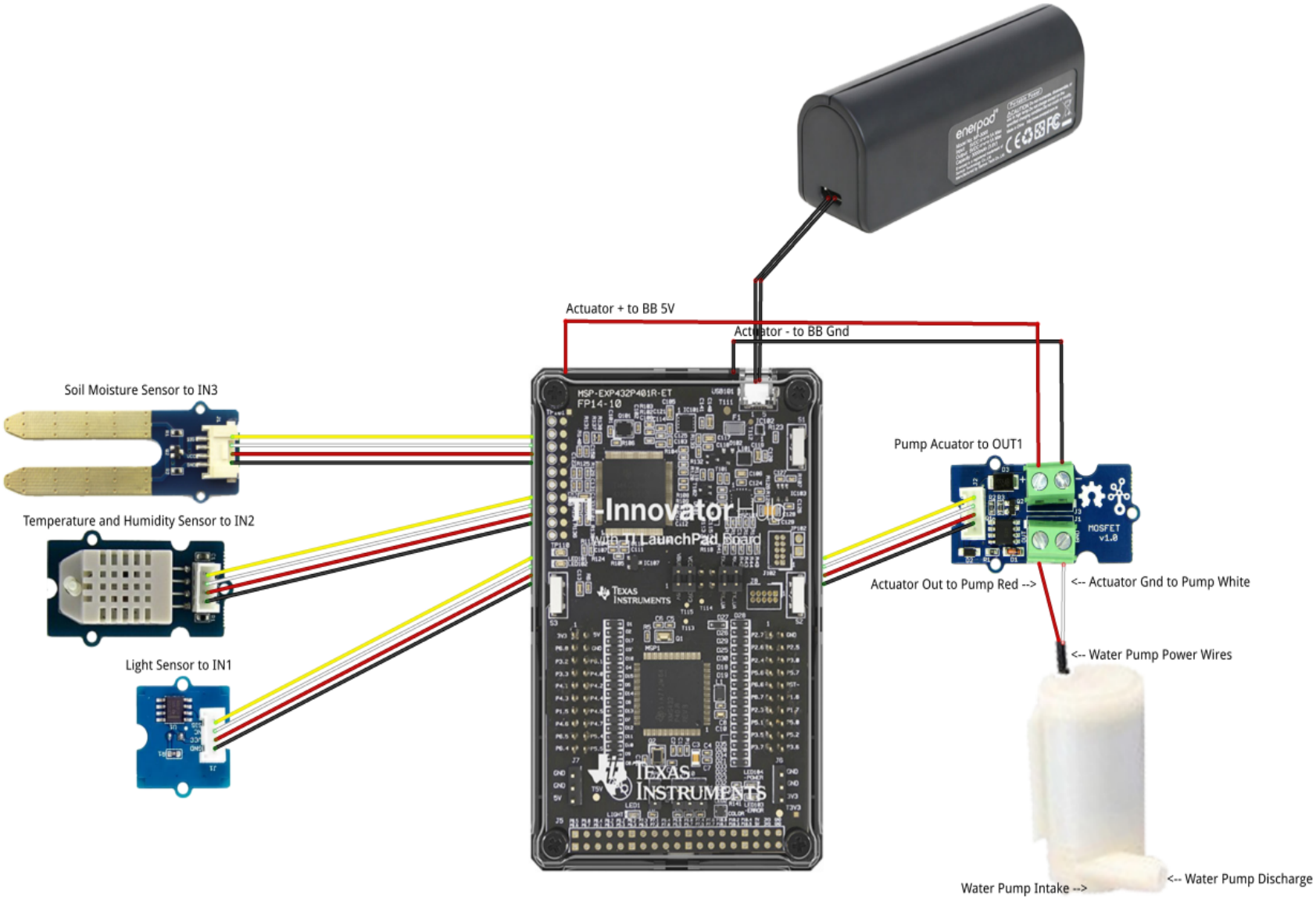
```
Prgm

Send "CONNECT ANALOG.OUT 1 TO OUT 1”
© ANALOG.OUT 1 is the object that sets the power
level of the MOSFET and the speed of the pump.

For n,1,5
 Send "SET ANALOG.OUT 1 eval(45*n)”
 Wait 3
 Send "SET ANALOG.OUT 1 0”
 Wait 3
EndFor

EndPrgm
```

The loop pulses the pump in 3 second increments at increasing power levels from the MOSFET starting at level 45 and growing to 225 in steps of 45. The pump stays on during a 3 second waiting period followed by a command to turn the pump off (power level 0).

Some possible challenges/tasks

- Try the pump at different levels (0-255) (and observe interaction with the soil)
- Try different patterns for pumping the water (trickle, pulse,…)
- …

Background: Control System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