Drought in Africa:
Smart Irrigation Project
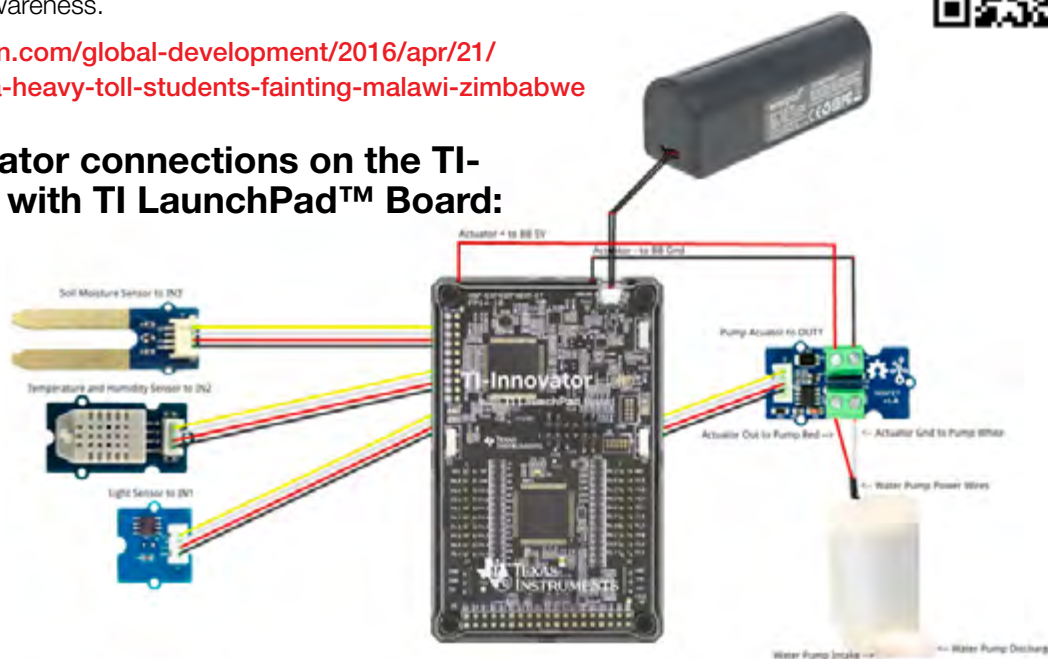

TEXAS INSTRUMENTS

Project overview

A drought in South Africa has caused a famine in Zimbabwe and local students are quitting school and soccer to stay home and help grow food for the family; read the full story in The Guardian using the QR code or URL below. Students are challenged to help solve the problem by designing and building a smart watering system to manage a limited amount of water collected in a cistern to irrigate a garden. The project serves as a framework to teach concepts in algebra, ecology, computer programming, engineering and global awareness.

https://www.theguardian.com/global-development/2016/apr/21/
drought-southern-africa-heavy-toll-students-fainting-malawi-zimbabwe

Sensor and actuator connections on the TI-Innovator™ Hub with TI LaunchPad™ Board:

Code snippet to CONNECT the Grove sensors:

```
Send("CONNECT LIGHTLEVEL 1 TO IN1")
Send("CONNECT DHT 1 TO IN2")
Send("CONNECT MOISTURE 1 TO IN3")
Send("CONNECT ANALOG.OUT 1 TO OUT1")
Send("RANGE LIGHTLEVEL 1 0 100")
Send("RANGE MOISTURE 1 0 100")
```
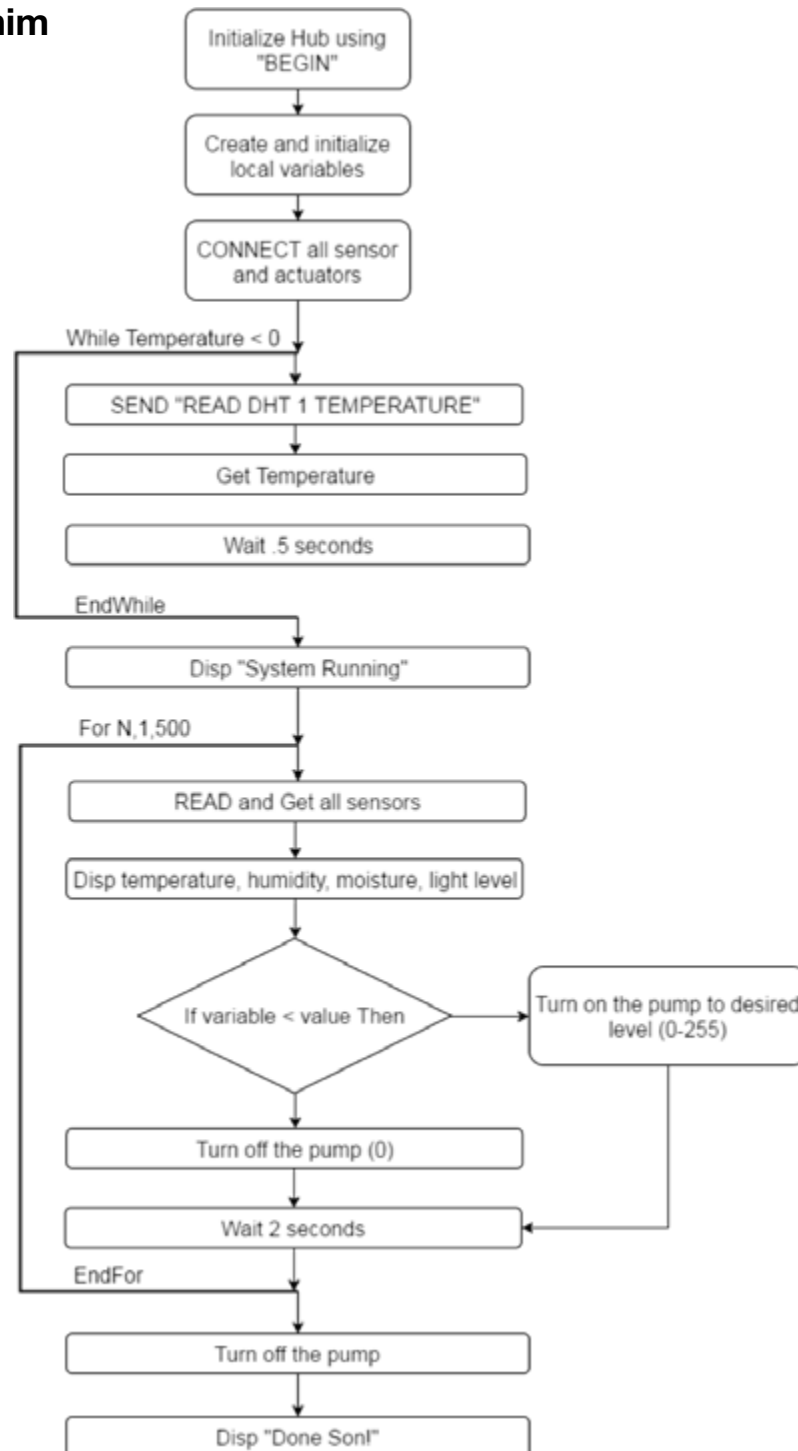
Code snippet to SET the Grove actuator:

```
255→S
Send("SET ANALOG.OUT 1 eval(S) TIME 5")
Disp "Speed Set for 5 Sec To:"
Disp S
Send("SET ANALOG.OUT 1 0")
```

Note: ANALOG.OUT 1 is the object used with the MOSFET to control the pump.

Code snippet to READ the Grove sensors:

```
Send("READ LIGHTLEVEL 1")
Get(L)
Disp L
Send("READ DHT 1 HUMIDITY")
Get(H)
Disp H
Send("READ DHT 1 TEMPERATURE")
Get(T)
Disp(T)
Send("READ MOISTURE 1")
Get(M)
Disp M
```

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Possible control algorithim

Initialize Hub using "BEGIN"

Create and initialize local variables

CONNECT all sensor and actuators

While Temperature < 0

SEND "READ DHT 1 TEMPERATURE"

Get Temperature

Wait .5 seconds

EndWhile

Disp "System Running"

For N,1,500

READ and Get all sensors

Disp temperature, humidity, moisture, light level

If variable < value Then → Turn on the pump to desired level (0-255)

Turn off the pump (0)

Wait 2 seconds

EndFor

Turn off the pump

Disp "Done Son!"

Parts list for project

» TI-Innovator™ Hub with TI LaunchPad™ Board

» TI-84 Plus CE or TI-Nspire™ CX handheld

» Seeed Grove - Temperature & Humidity Sensor (mfg part#: 101020011)

» Seeed Grove – Moisture Sensor (mfg part#: 101020008)

» Seeed Grove – Light Sensor (mfg part#: 101020014)

» Seeed Grove - MOSFET (mfg part#: 103020008)

» External Battery for TI-Innovator™ Hub (TI accessory)

» Fafada® Water Pump Motor DC 3V Mini Submersible

Water Pump for Fountain Aquarium 120L/H Max Lift 3.6FT (mfg part #: 44020256)

» 2 male to male breadboard jumper cables

» 1/4" I.D. (Inner Dimension) x 3/8" O.D. Outer Dimension) vinyl tubing.

» Drinking straws

» Duct Tape

» 1 Gallon milk jug

» Perlite or other medium for the plants to grow in