

UNIVERSITY OF PUERTO RICO AT MAYAGÜEZ

MAYAGÜEZ, PUERTO RICO

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING



WaveSphere: Progress Report #3

A PROGRESS REPORT SUBMITTED AS A PARTIAL REQUIREMENT OF THE
MICROPROCESSOR INTERFACING COURSE ICOM-5217

by

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1. Software Plan

Algorithm 1: Main Program

```
Initialize GPIO Ports;
Initialize Memory Variables;
Enable GIE;
while true do
    Disable All Interrupts;
    Activate Low Power Mode;
    while Shutdown Flag Cleared do
        if Diagnostic Flag Set then
            Execute Diagnostic Service;
        else if Retrieval Flag Set then
            Clear Retrieval Flag;
            Execute Retrieval Service;
        else if Sampling Flag Set then
            Execute Sampling Service;
            Execute Location Service;
        else if Status Flag Set then
            Clear Status Flag;
            Execute Status Service;
        end
    end
end
```

Algorithm 2: RF ISR

```
Power On Xbee Module;
Establish Connection;
Power Off RF;
Enable Xbee Interrupt;
Disable RF Interrupt;
Return from Interrupt;
```

Algorithm 3: Xbee ISR

```
Read Data From Xbee Buffer;  
if Data corresponds to Clear Diagnostic Mode then  
    Clear Diagnostic Mode Flag;  
else if Data corresponds to Diagnostic Mode then  
    Set Diagnostic Mode Flag;  
else if Data corresponds to Retrieval Mode then  
    Set Retrieval Mode Flag;  
else if Data corresponds to Sampling Mode then  
    Set Sampling Mode Flag;  
else if Data corresponds to Status Mode then  
    Set Status Mode Flag;  
else if Data corresponds to Shutdown Mode then  
    Set Shutdown Mode Flag;  
Modify LPM bit in stack stored SR to take the CPU into Active Mode;  
Return from Interrupt;
```

Algorithm 4: Diagnostic Event Service

```
Power Up All Components;  
repeat  
    Take measurement from Accelerometer;  
    Take measurement from Gyroscope;  
    Take measurement from Magnetometer;  
    Get location from GPS;  
    Get file system information from SD Card;  
    Get Light Sensor Output;  
    Toggle LED;  
    Get measurement from Power Meter;  
    Get Xbee Module Signal;  
    Send Measurements to Base Station;  
until Diagnostic Flag Cleared;  
Return;
```

Algorithm 5: Retrieval Event Service

```
Get file system information from SD Card;  
Send file system information to base station;  
Send all data to base station;  
Erase data from SD Card Return;
```

Algorithm 6: Sampling Event Service

```
Activate Xbee Module Low Power Mode;
Power on Accelerometer;
Power on Gyroscope;
Power on Magnetometer;
Clear Sampling Mode Flag;
Set Sampling Mode Timer;
while SamplingTimeOver Flag Cleared do
    Set Sampling Frequency Timer;
    Clear Sample Frequency Flag;
    Get Accelerometer measurement;
    Get Gyroscope measurement;
    Get Magnetometer measurement;
    Get Timestamp;
    Write to SD Card;
    while SampleFrequencyFlag Cleared AND SamplingTimeOver Flag Cleared do
        Do Nothing;
    end
end
Power Down Accelerometer;
Power Down Gyroscope;
Power Down Magnetometer;
Return;
```

Algorithm 7: Sampling Mode Timer ISR

```
Set Sampling Mode Flag;
Return from Interrupt;
```

Algorithm 8: Sampling Frequency Time ISR

```
Set Sampling Frequency Flag;
Return from Interrupt;
```

Algorithm 9: Location Event Service

Power On GPS;
Power On Xbee;
Enable Light Sensor Interrupt;
Establish Zigbee Connection;
repeat
 Get GPS Location;
 Send Location Data;
until *Sampling/Location is Cleared*;
Shut Down GPS;
Turn Off LED;
Return;

Algorithm 10: Light Sensor ISR

Turn On LED;
Disable Light Sensor Interrupt;
Return from Interrupt;

Algorithm 11: Status Event Service

Sync System Time;
Get SD Free Space Information;
Send SD Free Space Information To Base Station;
Get Battery Level;
Send Battery Level;

Appendices