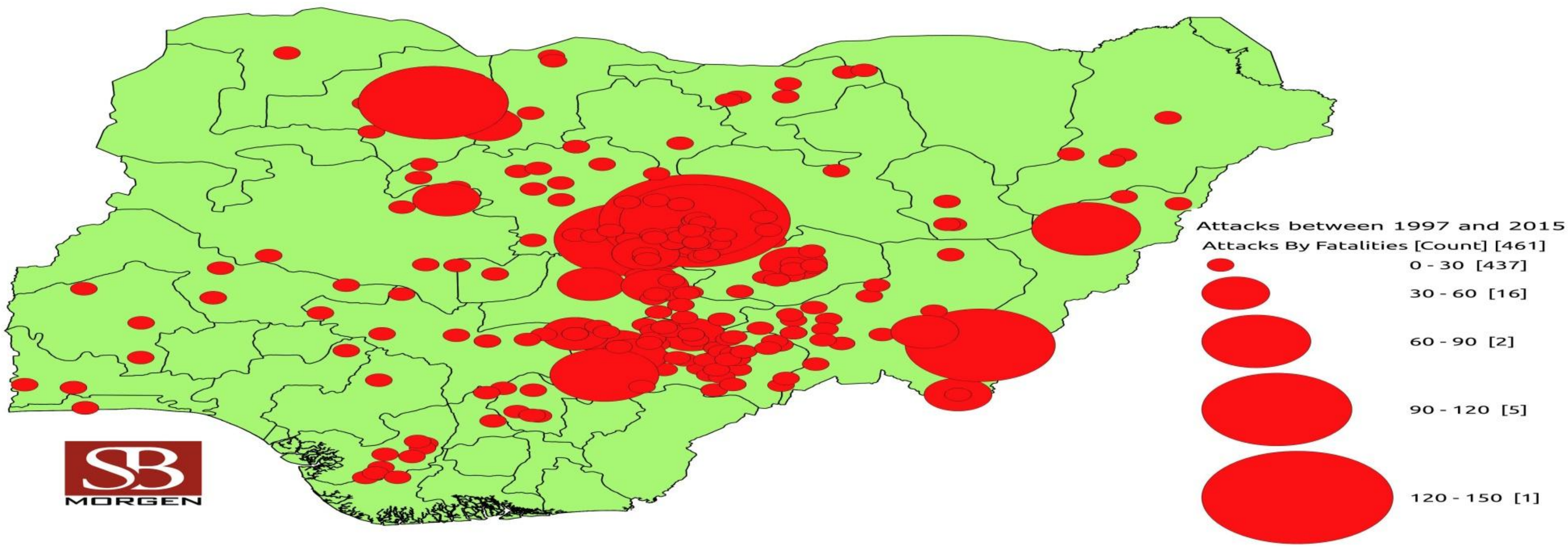
IoT MONITORING OF HERDS AND THE HERDSMEN

Igba Priscillia Uzoamaka

System Administrator, ICT Directorate, University of Jos, Nigeria.

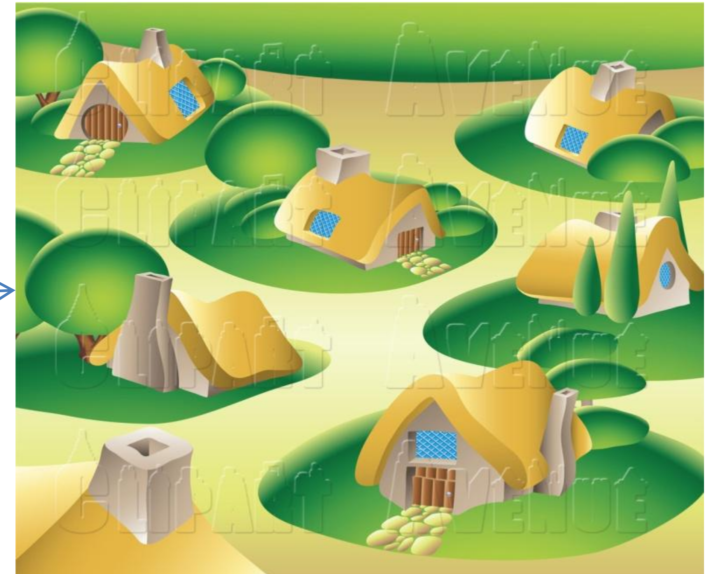
Background Research

In recent times, there has been a scourge of attacks on farmers, their farmland, produce and villagers by herdsmen in and around the middle-belt region of Nigeria. As a result of the vast land and sparse population in the rural communities and villages, the herdsmen find it less difficult to attack the farmers and villagers.



https://www.myknowledgeresources.com/2018/01/13/nigeria-verges-genocide-amid-new-wave-brazen-attacks-fulani-herdsmen/

EXISTING SITUATION



Objectives

To use IoT to mitigate these attacks by Fulani herdsmen on some rural communities over grazing areas in Middle-belt, Nigeria.

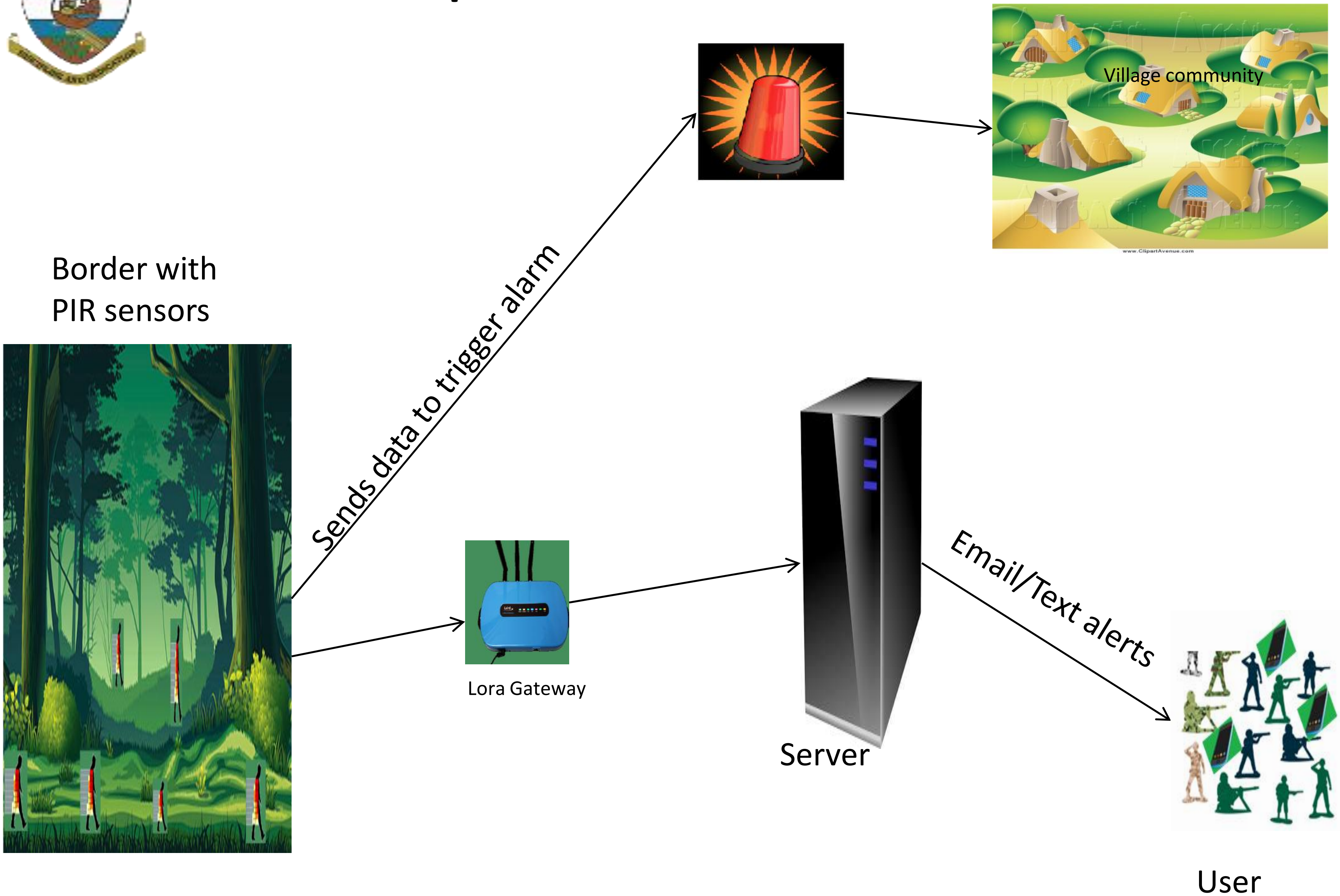
Proposed Actions

To install Passive Infrared(PIR) motion sensors to detect body heat within the location within a particular time.

To install an alarm sensor that triggers an alarm when motion is detected.

To use an outdoor wireless device to build a point to point backhaul network for the LoRaWan Gateway.

Proposed framework



Questions/ Pointers?

Traffic Generator for LoRa Networks

Anjali R. Askhedkar & Nilam M. Pradhan
Supervisor : Dr. Bharat S. Chaudhari
MIT World Peace University
Pune, India

MOTIVATION

- Possibility of a high density of LoRa devices simultaneously active in the same cell
- Difficulty in study of high density IoT scenario in real test beds
- Analyze the response of wireless networks with the increase in capacity
- Scalability of LoRaWAN is under investigation
- To test different network planning solutions for LoRa networks

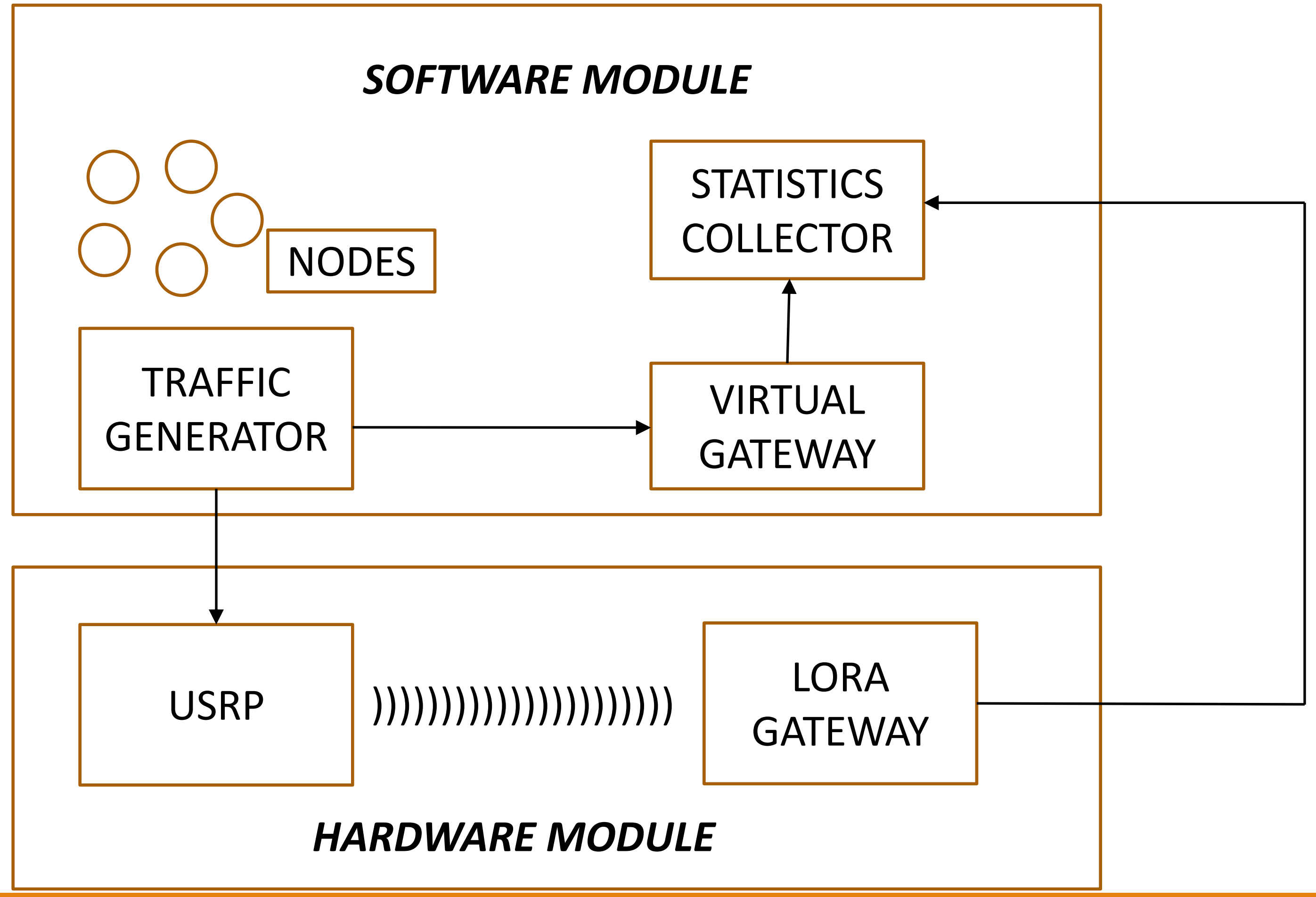
OBJECTIVE

- To implement a LoRa cell traffic generator that emulates the behaviour of multiple LoRa sensor nodes in the same cell by using software defined radio platform (USRP) and LoRa gateway
- Analyze the cell level performance of a LoRa network under different spreading factors

METHODOLOGY

- System can be considered as a simple superposition of independent Subsystems(single channel, single spreading factor)
- Use multiple transmission channels and spreading factors to generate a combined signal
- Implementation of traffic generator using USRP SDR platform and LoRa gateway
- Scheduling of signals to be transmitted in real time according to required traffic and cell scenario

EMULATOR ARCHITECTURE

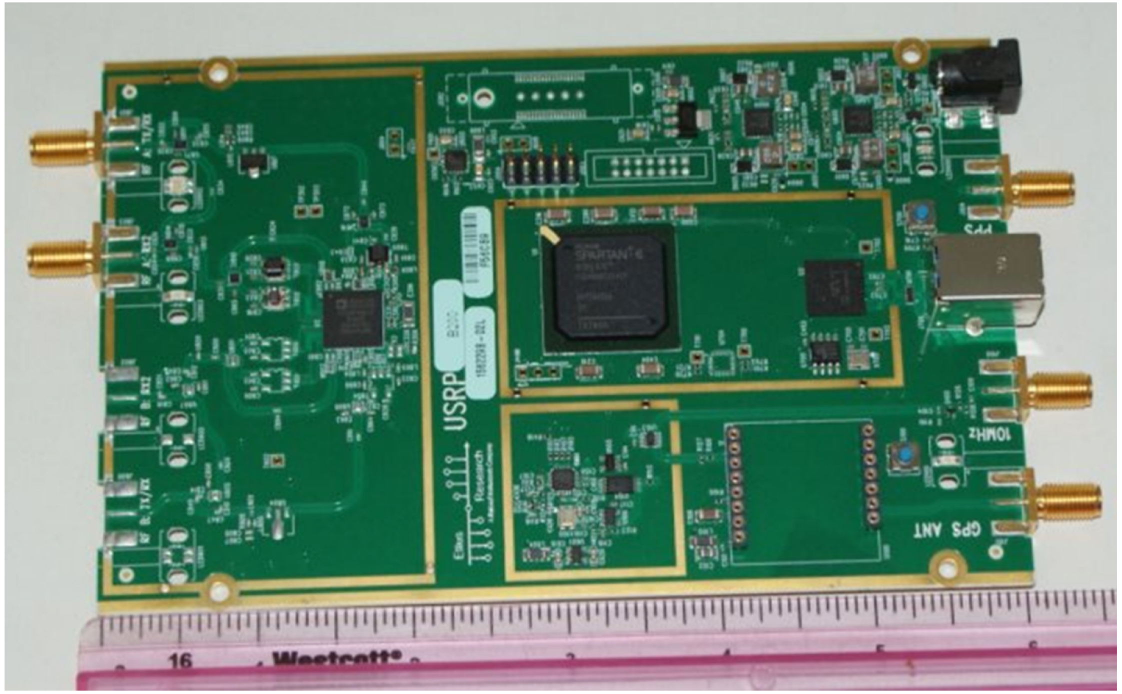


IMPLEMENTATION

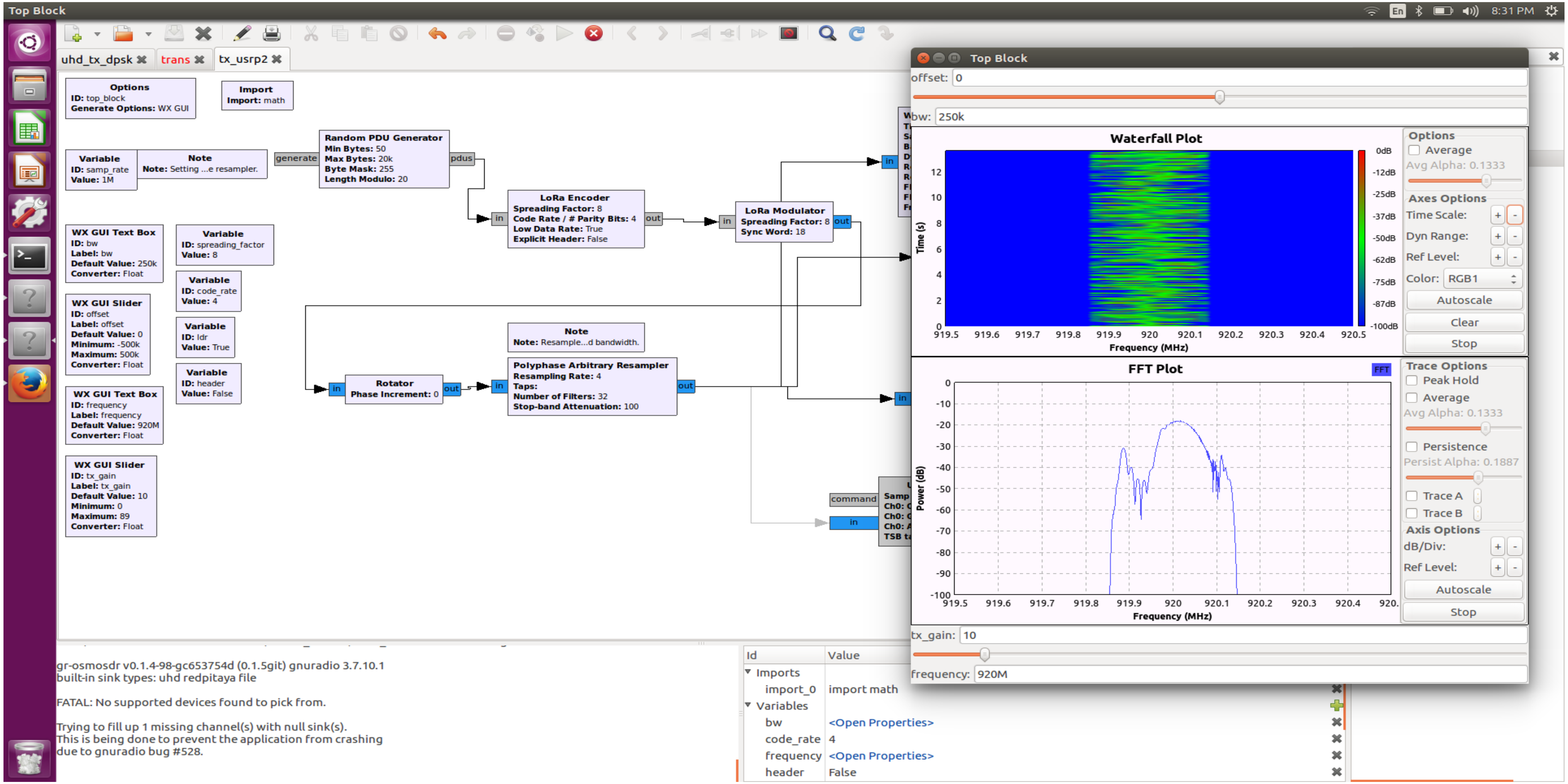
- Hardware: Ettus B200 USRP,

  LoRa Gateway
- Software : GNU Radio,

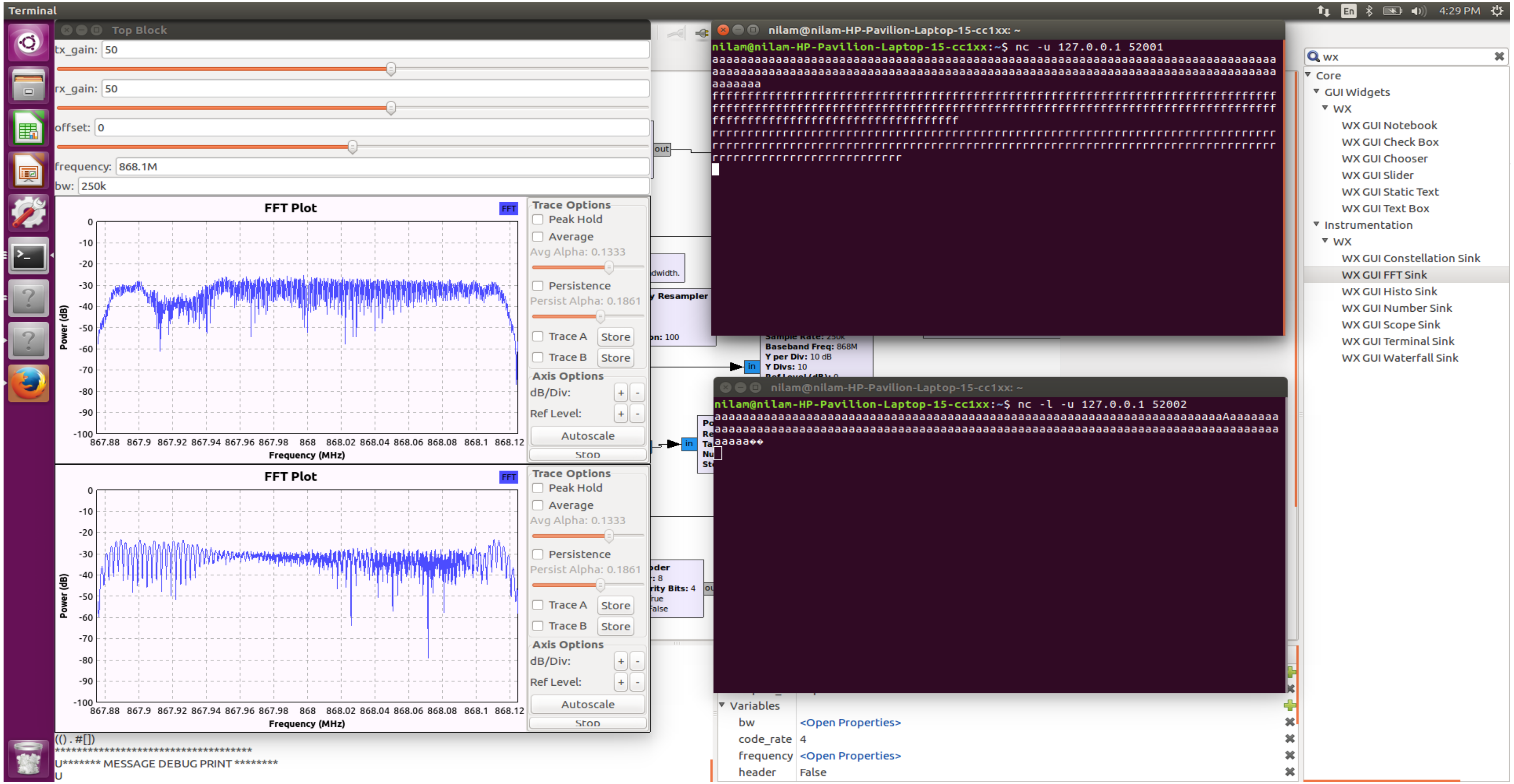
  Python



LoRa Communication using USRP



LoRa Communication using USRP



REFERENCES

- Michelle Gucciardo, Illinea Tinnirello, Dominico Garlessi “ Demo: A cell level traffic generator for LoRa Networks ”, MobiCom’17, October 16-20, 2017
- Matthew Knight, Balint Seeber, ”Decoding LoRa: Realizing a Modern LPWAN with SDR”
- www.semtech.com/technology/lora
- www.rtl-sdr.com/decoding-the-iot-lora-protocol-with-an-rtl-sdr/

MIT-WPU

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

Thank You !

RADIATION MONITORING IN NICARAGUA

Edith Villegas

Why measure radon?

- Naturally present everywhere in the environment
- Second leading cause of lung cancer worldwide
- Approximately half the radiation dose to the general population comes from radon
- Can be correlated to seismic activity

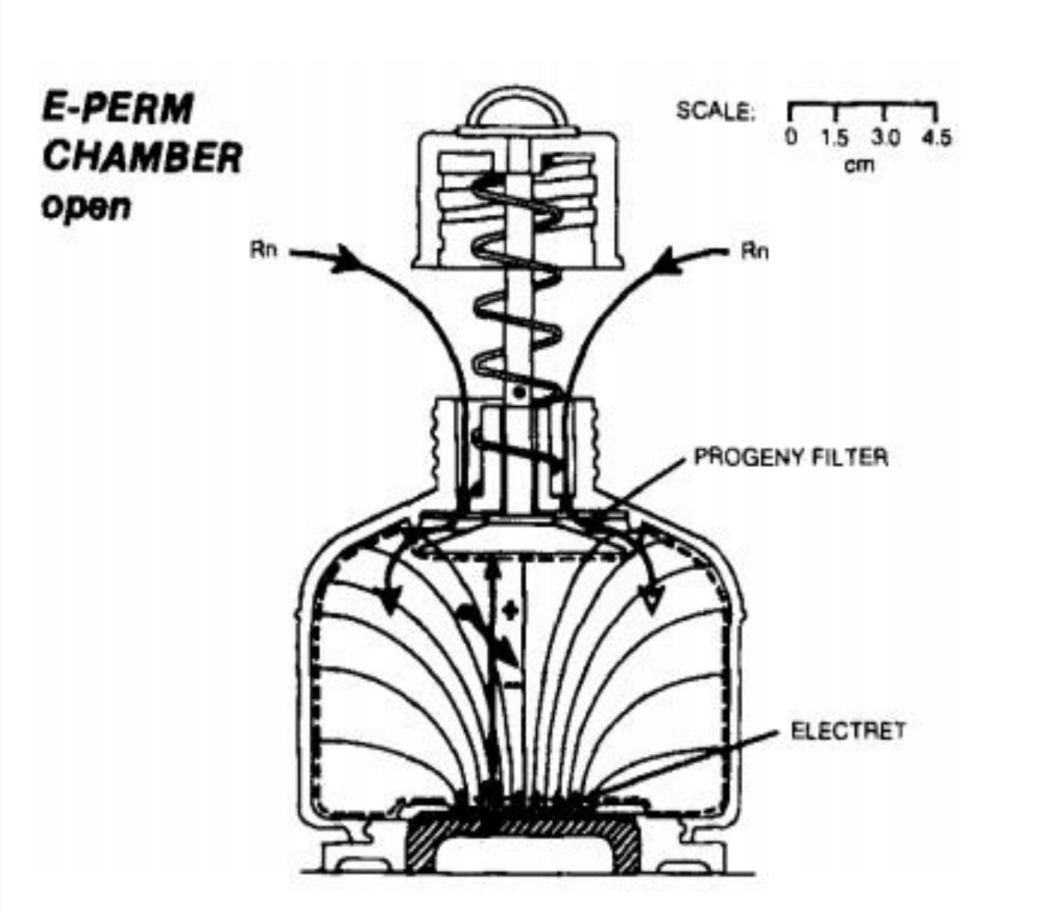
Radon Measurements

- Done in Masaya Volcano, in Nicaragua, and nearby houses
- Measurements found to be below acceptable limits
- More data points needed
- Plans to continue monitoring in mines

Ref: Measurements of 222Rn in localized Areas of Masaya Volcano, Nicaragua using E-PERM detectors

Meza J1, Roas N2

Radon detectors used



Why measure natural background radiation?

- Ionizing Radiation is present everywhere
- To assess the radiation dose naturally received by the population
- To know your environment and detect changes in it

Detectors used

- Thermoluminescent Detectors
- LiF:Mg,Cu,P material (more sensitivity)
- Passive detectors

Workplace monitoring

- Monitoring of 6 border posts in the country, using TLDs
- Detects radiation from high energy x-ray machine
- Detects sources going by

Ref: Evaluacion de dosimetria ambiental en 6 puestos fronterizos de nicaragua utilizando dosimetros termoluminiscentes. Norma Roas, Fredy Somarriba

Background Monitoring

City	H*(10) Dose Rate (Air) [nSv/h]
Granada	88 ± 2
Masaya	71 ± 18
Jinotepe	77 ± 1
Managua (1)	63 ± 0,3
Managua (2)	67 ± 2
Managua (3)	84 ± 0,4
Estelí	101 ± 1
Juigalpa	75 ± 18
El Rama	89 ± 17

Implementing IoT

- Automatization of the process
- More data points in time (at least twice a day)
- Data immediately available

Detector Characteristics

Background Measurement:

- High sensitivity for lower dose rates (~50nSv/h)

Workplace monitoring

- Medium sensitivity for low doses, wide range

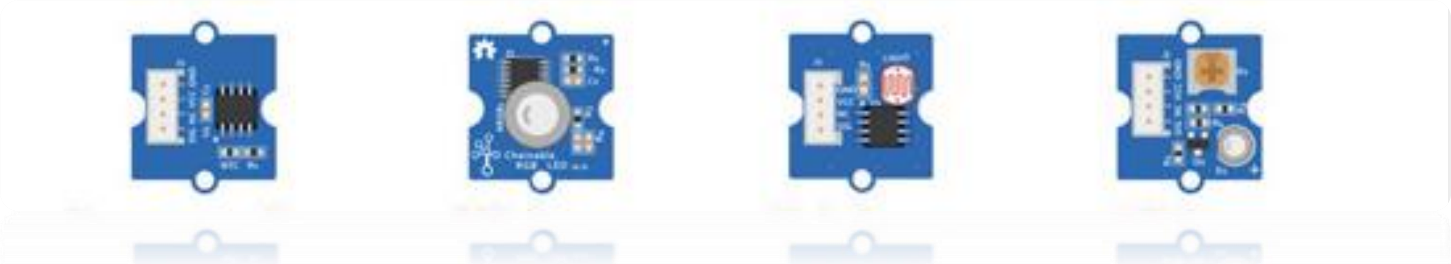
Calibration of detectors

- Calibration of gamma detectors using 137Cs source
- Calibration of radon detectors by intercomparison (in a sealed chamber with a radon source)

Expected Outcomes

- Real time monitoring for workplaces
- More data points on radiation across the country
- More data points on radon, more frequently spaced
- In places where it can be correlated to seismic and volcanic activity

Thanks!



CONTROL AND MONITORING SYSTEM FOR NEONATOLOGY ROOMS FROM NICARAGUA

Greyner Vanegas

Néstor Traña

Abraham Ampie

HOW DOES THE IDEA START?

HOW DOES THE IDEA START?

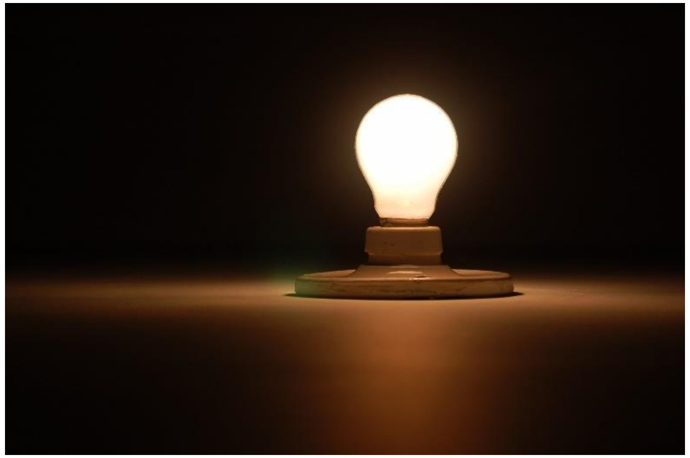
HOW DOES THE IDEA START?

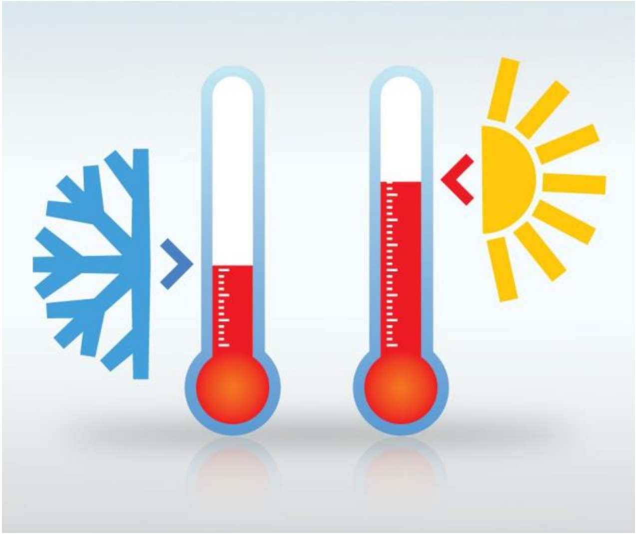
QUESTION?

- IS IT NECESSARY SO COLD?

(OMS/UNICEF, 2017)

SUSCEPTIBLE





THE NEWBORN IS SUSCEPTIBLE TO MANY FACTORS SUCH AS EXCESS LIGHT, NOISE AND THE SUDDEN CHANGE IN TEMPERATURE

(OMS/UNICEF, 2017)

AROUND 2.6M CHILDREN DIED DAILY IN 2016 BEFORE REACHING THE AGE OF FIVE, OF WHICH 46% DIED DURING THEIR FIRST 28 DAYS OF LIFE

(OMS/UNICEF, 2017)

FOUND


STANDARD

ANSI/ASHRAE/ASHE Standard 170-2008

Ventilation of Health Care Facilities

ASHRAE ASHE ANSI

ASHRAE, ASHRAE/ASHE STANDARD 170-2008, 1791 Tullie Circle NE. Atlanta, 2008.

THE ROOMS MUST COMPLY WITH:

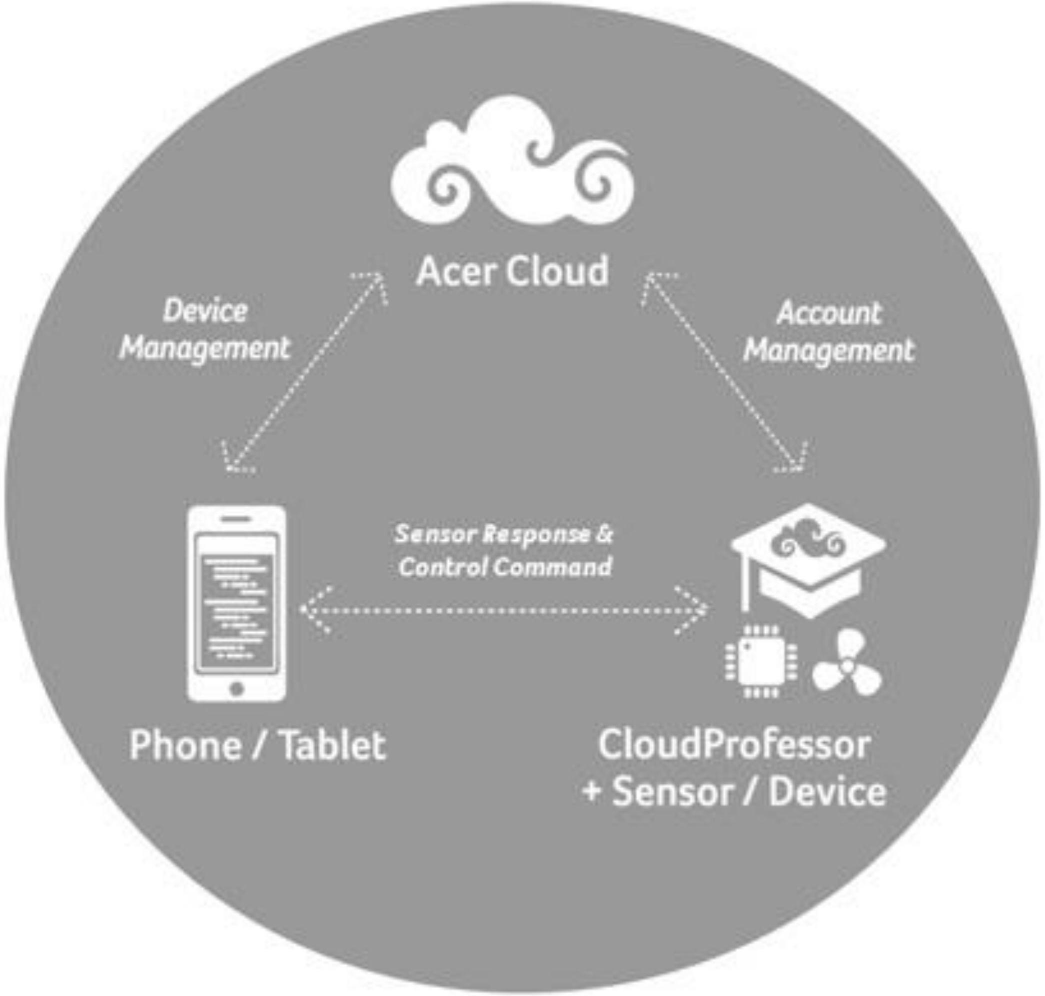
- ACOUSTICS — LESS 61DB
- LUMINOSITY — 300 LUX
- CLIMATIZATION
  - TEMPERATURE — 22º C - 26º C
  - HUMIDITY — 30% - 60%

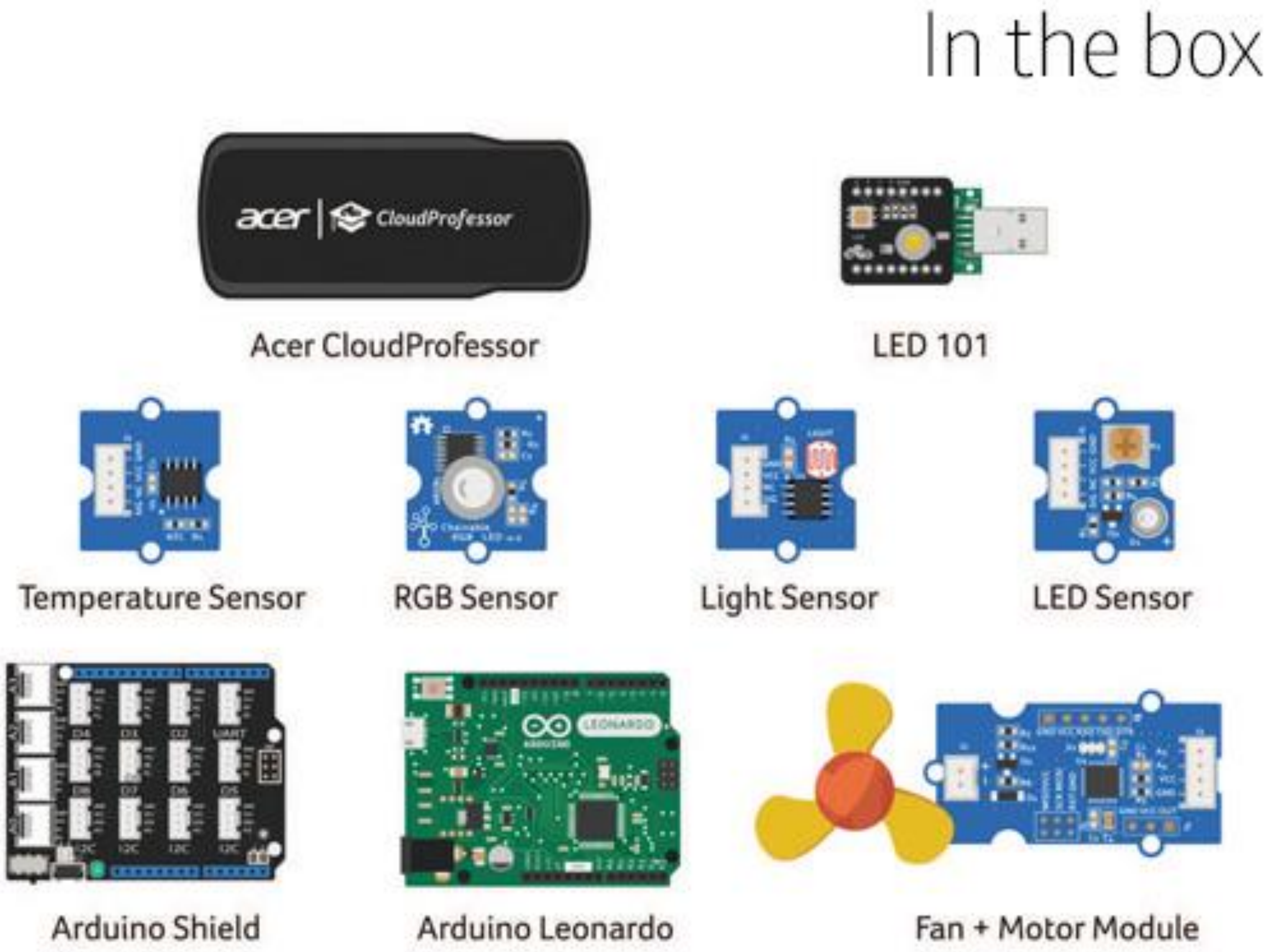
HOW TO REGULATE THIS AUTOMATICALLY?

HOW TO REGULATE THIS AUTOMATICALLY?

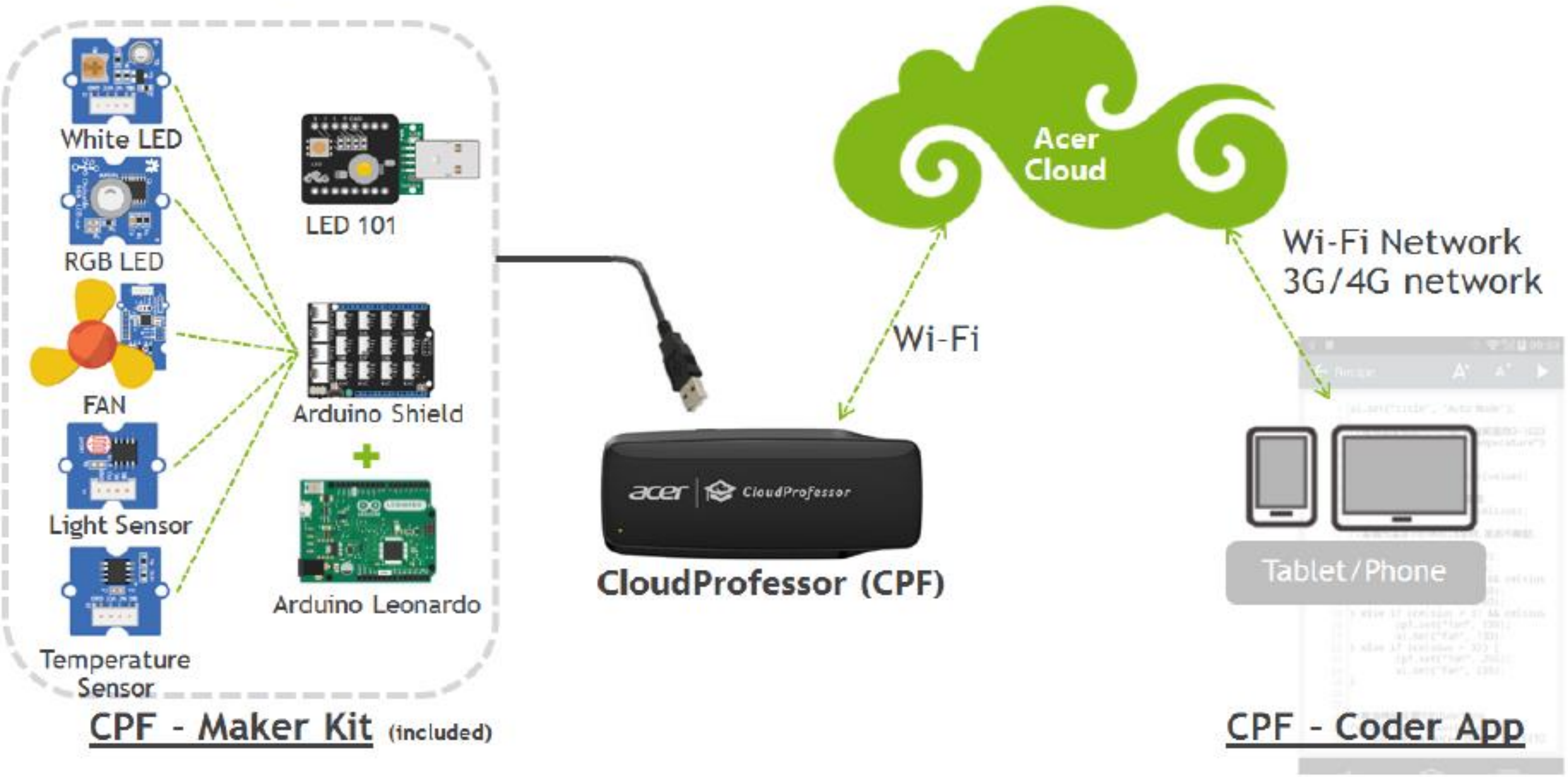
ACER CLOUDPROFESSOR

SUPPORT 62 SENSORS





1
2
3
acer
CloudProfessor
4
5
6

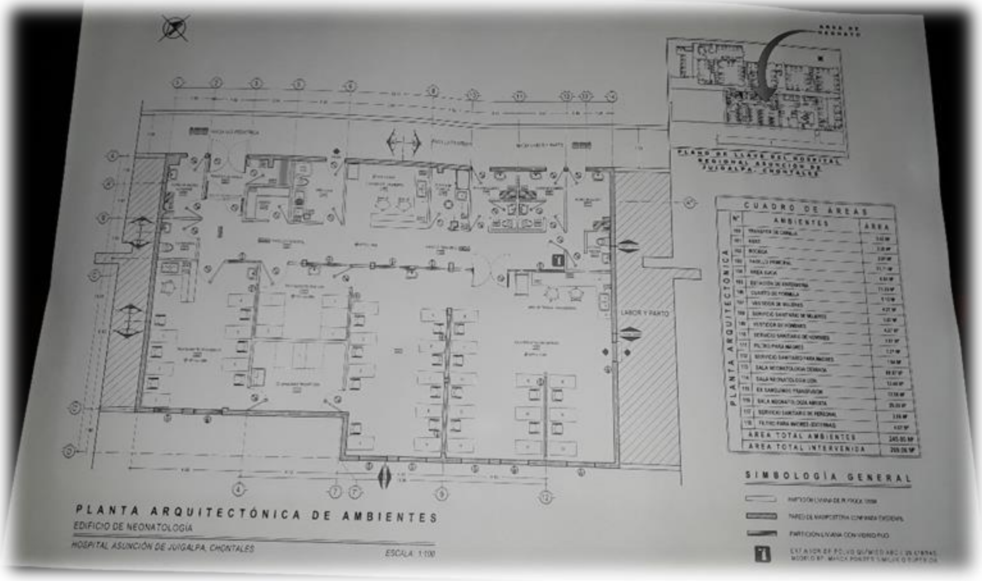


White LED
RGB LED
FAN
Light Sensor
Temperature Sensor
LED 101
Arduino Shield
Arduino Leonardo
CPF - Maker Kit (included)
acer CloudProfessor
CloudProfessor (CPF)
Acer Cloud
Wi-Fi
Wi-Fi Network
3G/4G network
Tablet/Phone
CPF - Coder App

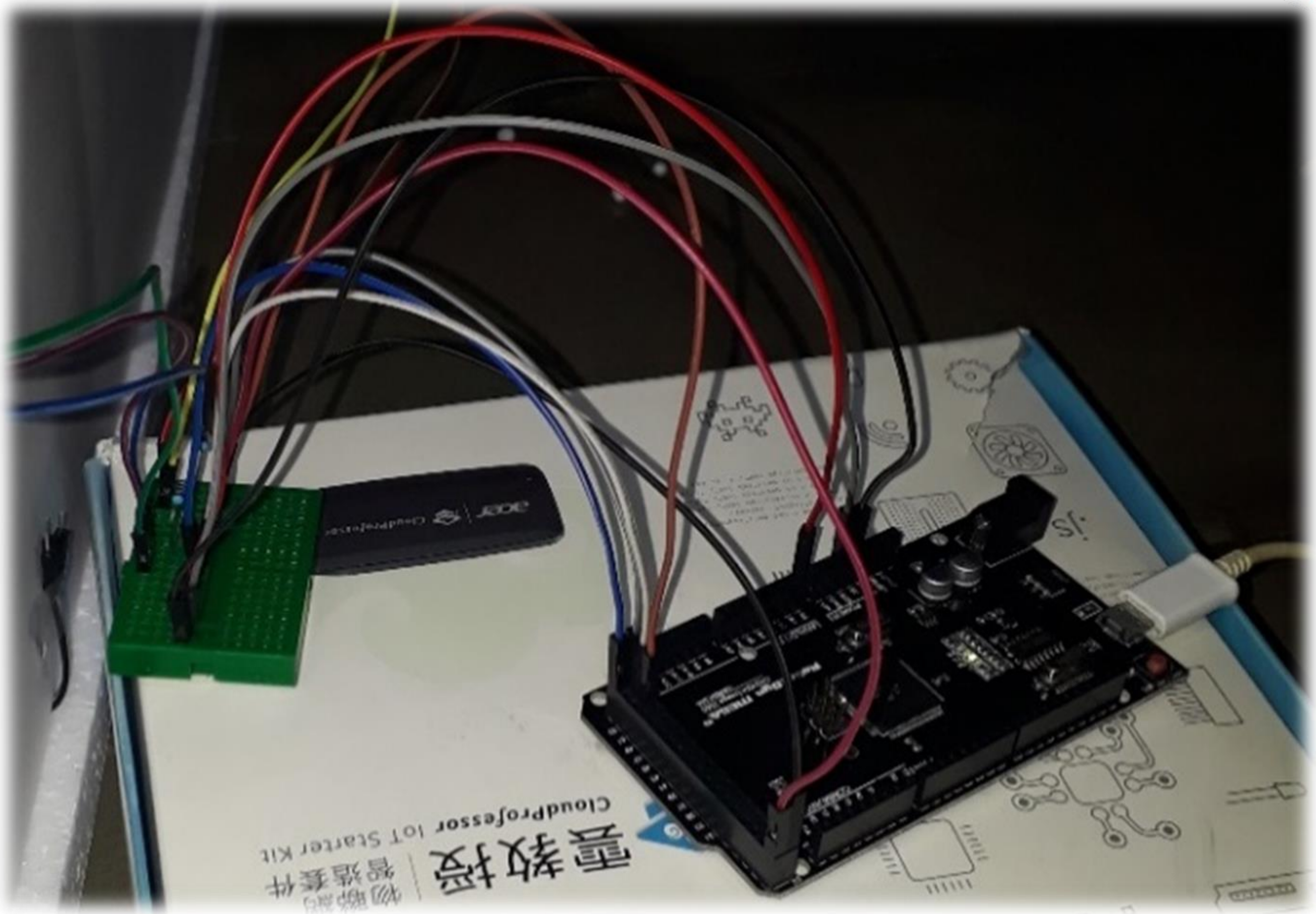
THE ROOMS MUST COMPLY WITH:

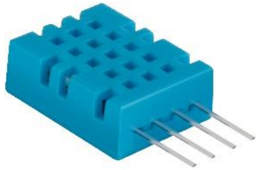
- ACOUSTICS → LESS 61DB
- LUMINOSITY → 300 LUX
- CLIMATIZATION
  - TEMPERATURE → 22º C - 26º C
  - HUMIDITY → 30% - 60%

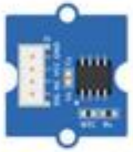
TEST SCALE MODEL – PHASE 1



Líder en Ciencia y Tecnología



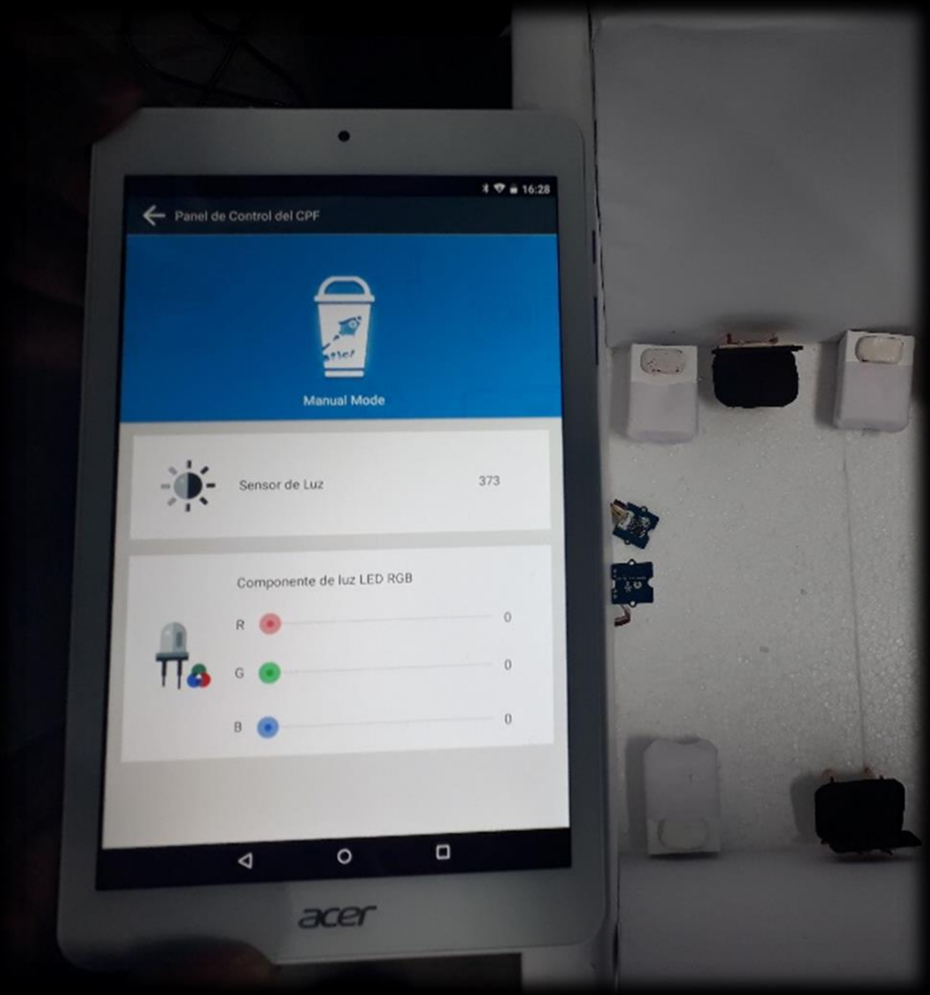



Temperature Sensor

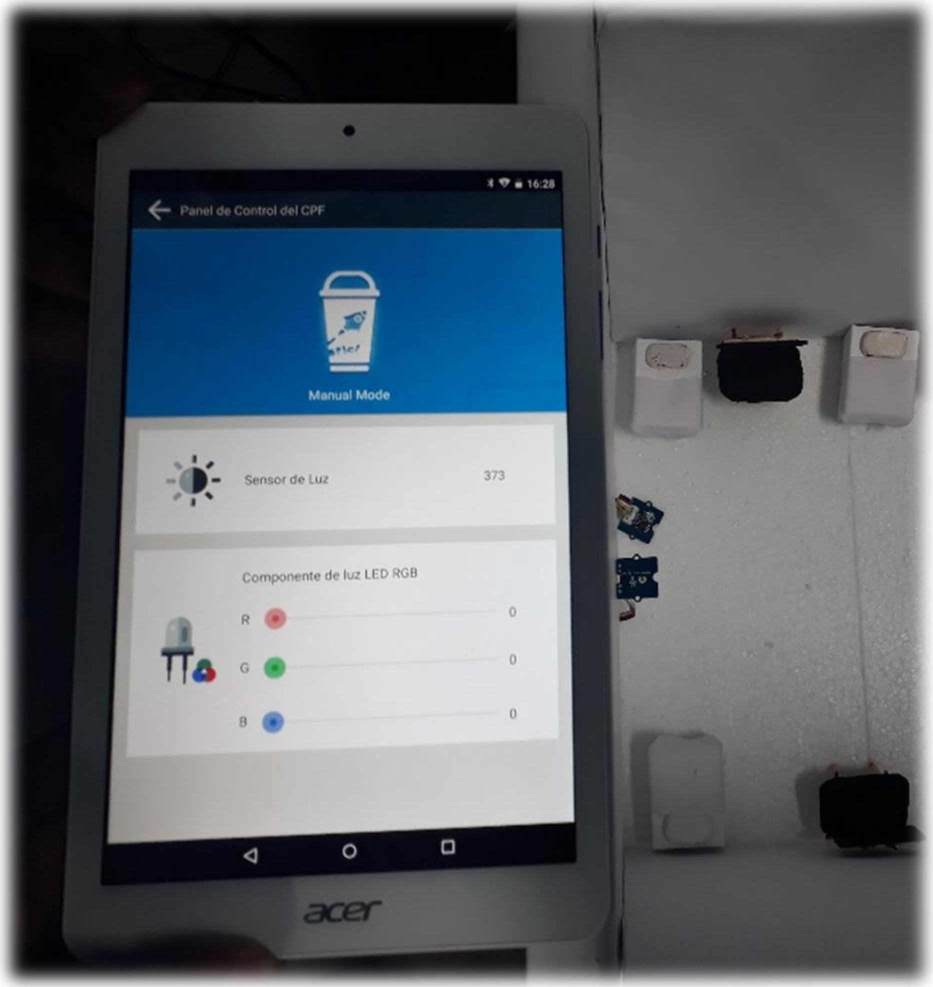

RGB Sensor


Light Sensor

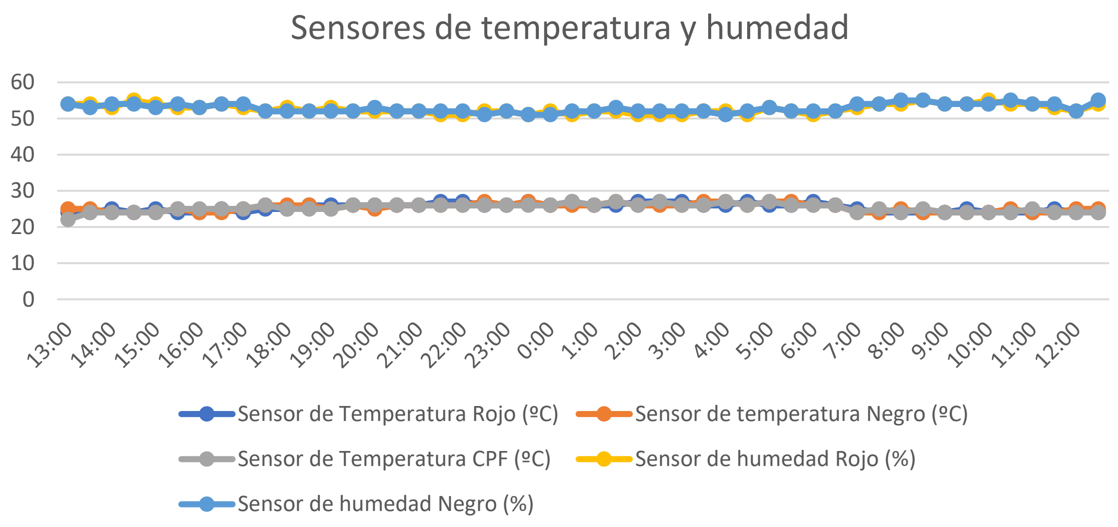

LED Sensor

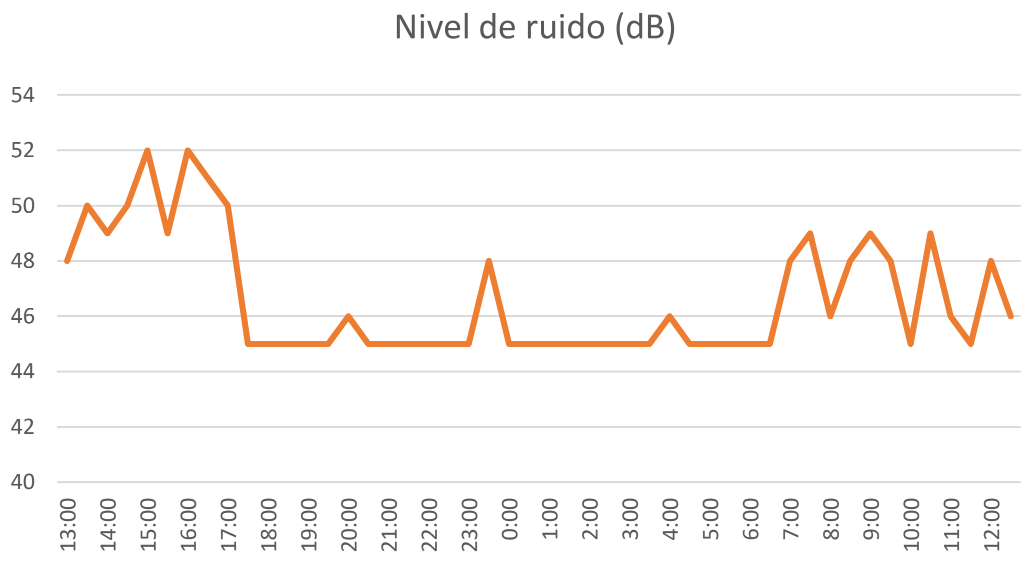

16:28
Panel de Control del CPF
Manual Mode
Sensor de Luz
373
Componente de luz LED RGB
R
0
G
0
B
0
acer

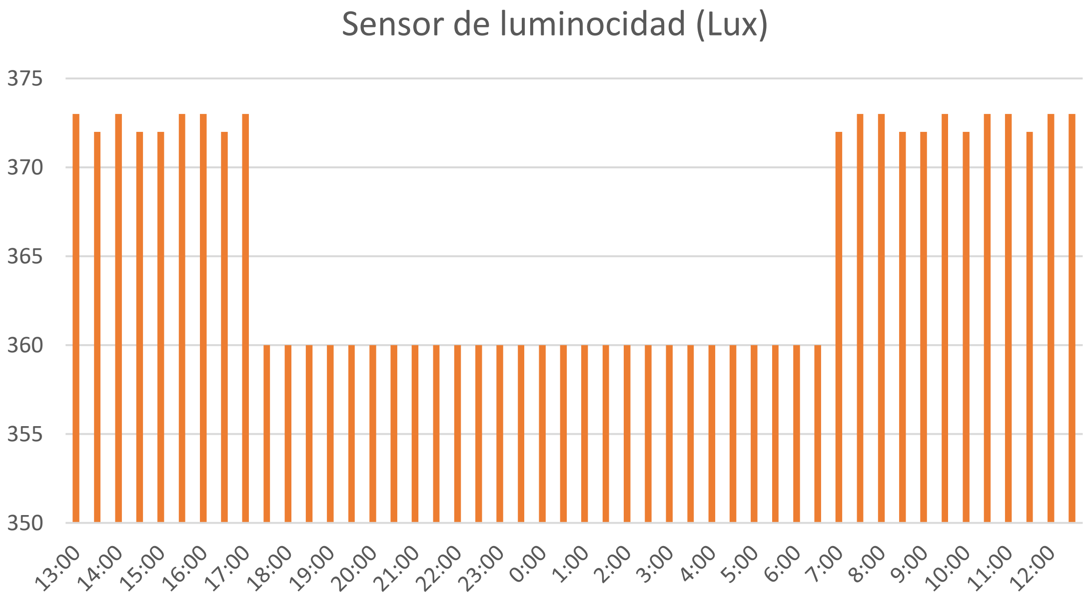
LUMINOSITY – 300 LUX



TEMPERATURE 22º C - 26º C


Sensores de temperatura y humedad
60
50
40
30
20
10
0
13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00
Sensor de Temperatura Rojo (ºC)
Sensor de temperatura Negro (ºC)
Sensor de Temperatura CPF (ºC)
Sensor de humedad Rojo (%)
Sensor de humedad Negro (%)


Nivel de ruido (dB)
54
52
50
48
46
44
42
40
13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00


Sensor de luminocidad (Lux)
375
370
365
360
355
350
13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00


ANY QUESTIONS?
ASK GOOGLE


Thank you

IoT based soil monitoring and crop management Intelligent System using Machine Learning algorithms

CASE STUDY FOR BESHELO BASIN

PHD RESEARCH CONCEPT

Outline

- Introduction
- Research Problem
- Objective
- Conceptual Framework
- Research Impact

Introduction

- Agriculture is the pillar for the economical dev’t of Ethiopia
- It is also main source of food for the country
- However, food insecurity is a concern in Sub-Saharan Africa, including Ethiopia
- Traditional agricultural practices, climate change and unavailability of abundant, well-organized information are some factors affecting agricultural productivity

Introduction

- Collection and analysis of crop production impacting parameters can help generate useful information
- The presentation and analysis of trends of a particular location can also help in risk prediction and disaster management
- Fertilizer and pest usage can be effective if supported with necessary attributes

Introduction

- ICT can be a wayout
- In countries like Ethiopia with:
  - Limited Network infrastructure
  - Exagurated hardware & software cost
  - High illiteracy rate
- Usable, cost-effective yet efficient ICT systems shall be produced

Research Problem

- **How can environmental and soil parameters that affect crop yield and productivity of agriculture be collected using IoT?**
- **How to use GIS, DIP and ML techniques to analyze collected data?**
- **How can agricultural disasters be prevented thru smart systems?**

General Objective

- The general objective of the research is to design an IoT based soil PH, soil moisture and soil Nitrogen level data collection system and analyze the collected data through GIS and Image processing techniques and predict crop yields and other valuable information using machine learning algorithm

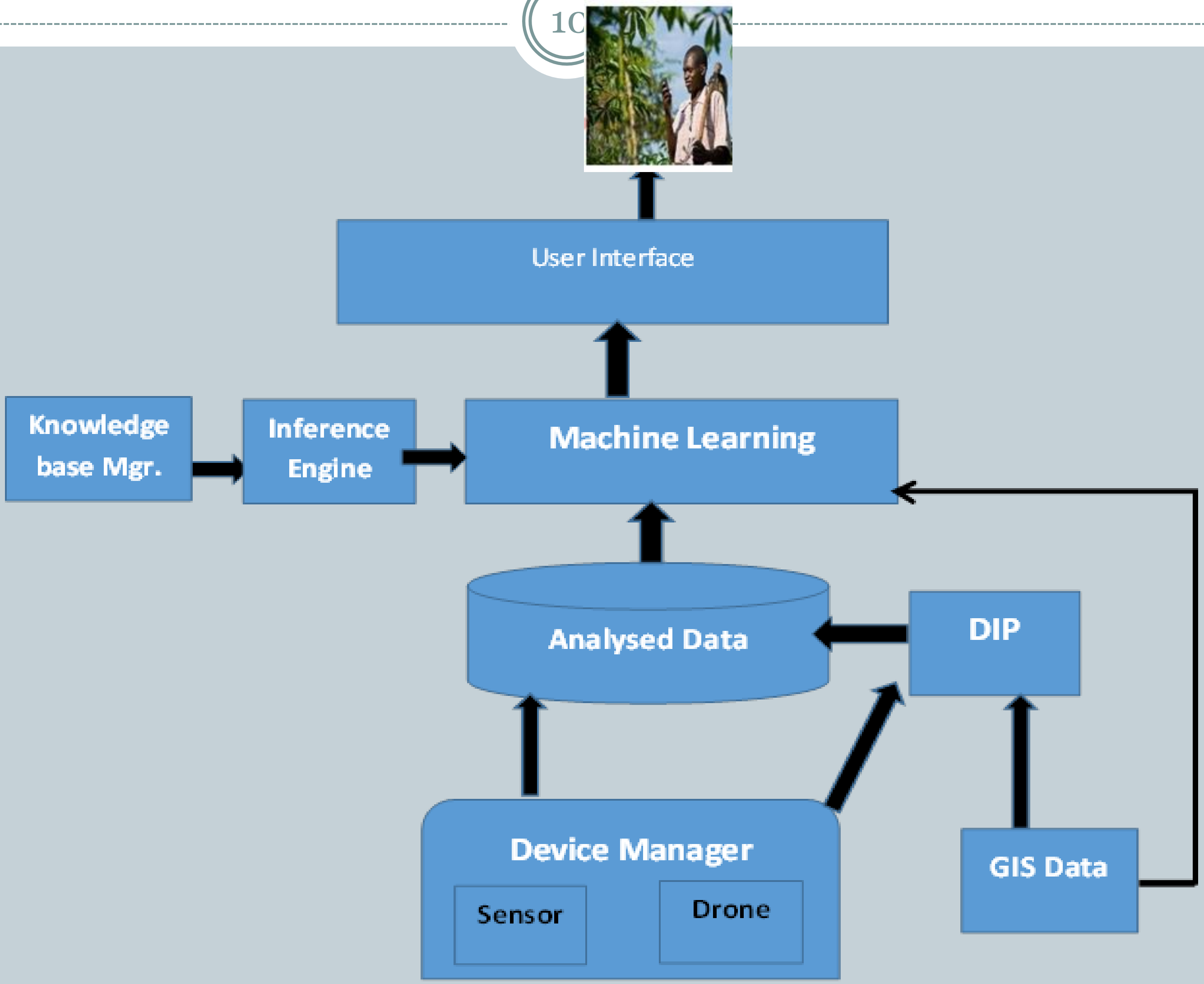
Specific Objectives

- Model environmental and soil factors affecting crop yield
- Model topography of the target location using GIS
- Design an efficient network of IoT so as devices to server communication can be achieved with minimal cost and low power requirment
- Implemenet and deploy sensors to collect target parameters from the field
- Capture leaf or stem images of crops from close proximity using either drones or digital cameras.
- Collect and analyse relevant GIS data

Specific Objectives

- Design an algorithm to construct a knowledgebase of the system
- Analyse the captured images using DIP techniques to determine the soil's N level
- Process data collected from sensors using GIS tool
- Design an enference engine using machine learning algorithm which generates new information from processed data
- Integrate the aforementioned components and construct a system that can predict yield improving situations

Conceptual Framework



Outcome and Research Impact

- Gathering and systematical storage of environmental and soil parameters in real-time
- Prediction of crop yield improving and disaster prevention data
- Design expert model and efficient IoT network architecture for agriculture

Thank you

Questions/Comments/Feedbacks???