COWShED

Senegal Chapter

Interim Report

July,6th 2017

1. Project information

- **Project leader:** Moussa DIALLO (moussa.diallo@ucad.edu.sn) ISOC Member, COWShED's Project Manager, Professor in Computer Science department of Ecole Superieure Polytechnique

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Responsible, Professor in Computer Science department of Ecole Superieure Polytechnique.

- **Partner organizations**

- **Total amount awarded: $ 26,000.00**

- **Period covered by this report: 01/2017-06/2017**

PROJECT TEAM

2. Project Summary

Pastoral breeding systems in Senegal are conditioned by the raining season. In such case, transhumance is developed by breeders to lead livestock's where grass and water points are available. Nevertheless, this transhumance incurs several problems such as conflicts between livestock farmers and farmers, water shortages and/or the potential over-use of water points. Therefore, enabling radio communication between breeders and geolocalization system in order to find either good routes that do not cross farms, or grass and water points are mandatory. Unfortunately, the transhumance routes used by breeders in Senegal cross no cellular coverage areas called white spots. Therefore, the project proposes a geolocalization communication system based on long range radio frequency transmission.

3. Project Background and Justification

The livestock transhumance in Senegal is done in several areas and more specifically in the sylvo-pastorale areas located in the Ferlo's region where it is difficult or impossible to communicate with terrestrial communication systems. The main reason is due to the existence of white spots. A white spot is defined as a no cellular coverage area.
To overcome the presence of white spot satellite communications can be used. However, in underserved areas, satellite communications are very expensive for people.

Therefore, we propose a low-cost communication for rural population such as breeders, farmers based on long range radio communication within ISM (Industrial, Science and Medical) bands. It is worth noticing that the ISM band is free. The proposed autonomous mobile mesh network is developed by breeders to lead livestock's, in a safe manner, where grass and water points are available. Our main goal is to encourage activities that can generate financial returns for rural population by preserving the environment.

4. Project Objectives

The main goal of the COWShED project is to enable a real time communication system for breeders based on RF transmission within ISM bands for no cellular coverage areas. This will lead to new services for rural citizens and/or breeders providing them useful information such as available water point, safe areas, or transhumance routes. The following activities are realized:

- development of the GIS client and deployment into breeders' smartphone.

- designing and building personal mobile relay.

-deployment strategies and network dimensioning.

-development of applications for the communication between personal mobile relay and breeders' smartphone.

-development of a mobile GIS middelware.

-30 targeted breeders having more than 10 animals will be equipped with a smartphone and mobile personal relay

-30 breeders trained for the use of ICT

5. Project Activities Completed so far

For the implementation of the project, we started with a research step that allows us to decide on all the technologies to be used. These technologies must meet the needs of the project. Then we went to a test campaign of the chosen technologies to be able to confirm the choice made on them. We have travelled more than 40km in the city of Dakar to make range tests on the technology that allows the sending of data in the white areas (LoRa). We also left 100km from the capital of Senegal to do the same tests in an environment similar to where the project will be deployed.

Figure1. Briefing of the test setup

To carry out the tests, we had two cars where we placed antennas and we were moving around to see how far the signal would go.

Figure 2. Preparation of test equipment

Figure 3. two antennas on top of the car receiving data from the base station located in the other car.

Figure 4. Carrying out the tests, a breeder and some cows in background

The results of the tests are rather satisfactory and are in accordance with our expectations. We are hoping for better results in the deployment area which will

certainly present better conditions. Once the tests were finished, we made a prototype allowing communication between two Smartphones. This prototype is based on LoRa and Bluetooth technologies. Bluetooth is used to allow a link between the user's phone and the relay that allows transmission over long distances (LoRa). The link in the Project Outcomes is a video that gives a complete description of the prototype and how it works. We then found an improved solution of the first prototype. This solution is based on WI-FI and LoRa technology. The change of choice is motivated by a better stability of the WI-FI compared to the Bluetooth and the fact that there were too many wires on the first one.
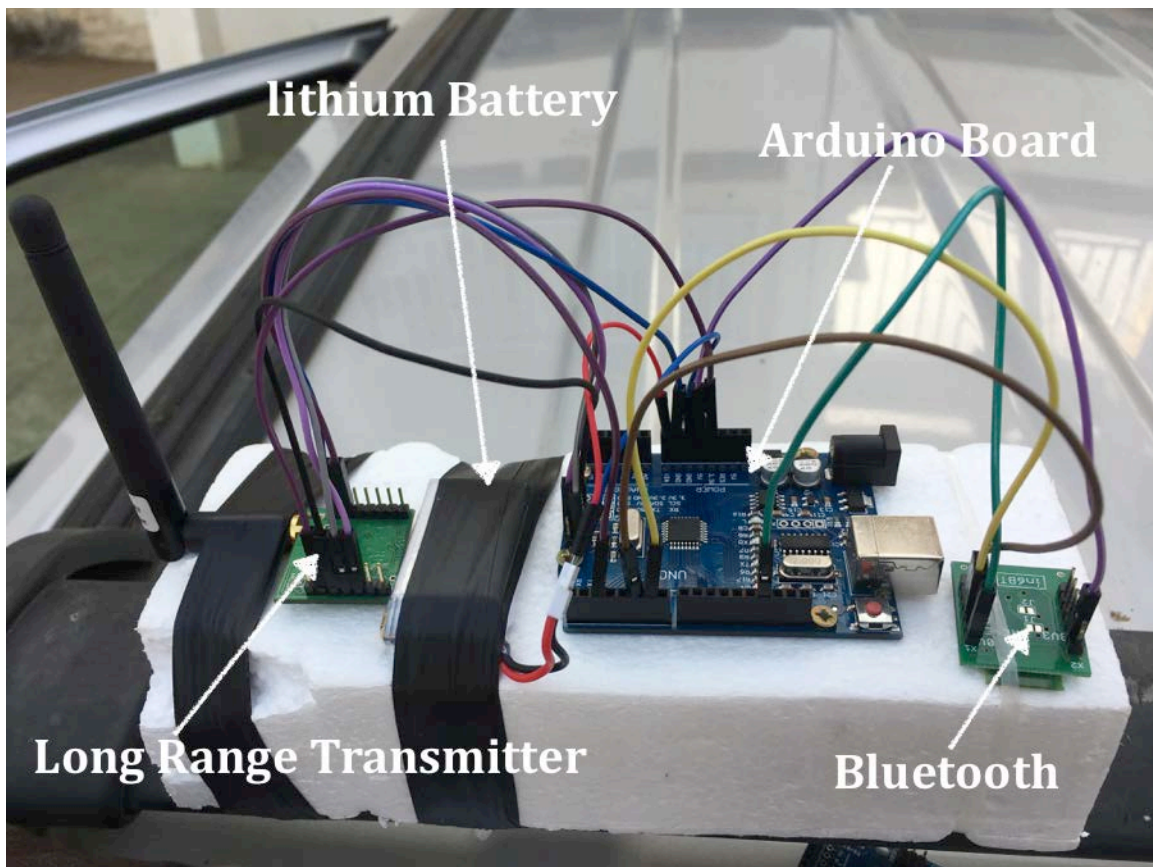

Figure 5. Prototype of the old Mobile Relay

This solution is therefore the final solution adopted for this project and will be used as a mobile relay for each breeder. We also developed a mobile application to exchange information and to geolocate our self and also geolocate other people that have the prototype. At this level of the project, only the sending of text message is possible and the application runs on Android systems. Knowing that in the area where the project will be deployed electricity will not be common, we thought of finding a Solar Power Kit. This device will recharge the relay as well as the smartphone. This kit has a battery that is recharged by a solar panel. The panel is chosen so that it is not bulky. We have therefore purchased 15 devices (Relay, Smartphones, Solar Kit).
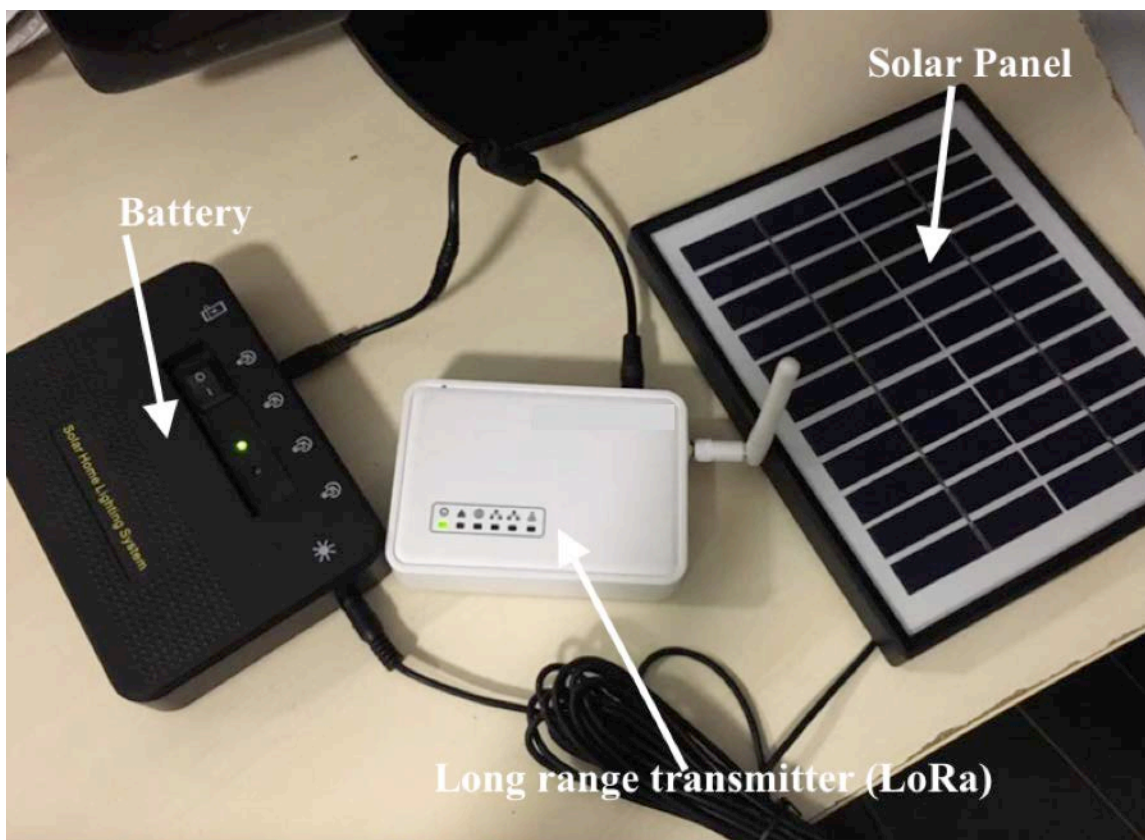

Figure 6. Prototype of the new Mobile Relay

We are planning a first trip to the Ferlo area in the month of September. We will go to 10 pre-selected villages to make real environment tests. In the following we plan to add features in the application such as sending voice and image messages to meet the real needs of breeders who are mostly illiterate.

6. Project outcomes

During these 6 first month, we showed the feasibility of the project. It means to implement a prototype allowing a communication between two Smartphones without having to use the infrastructures of the existing mobile networks and all of this has to be free of charge. The link below is a video that describes this prototype.

COWShED Beyond The net: https://www.youtube.com/watch?v=zxz6lLtYKwU

7. Any changes in the design of the project

For now, we don't have any big change on the project plans, we normally should give progress and final report at normal dates.

8. Dissemination and Chapter presence

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The project contributed to the presence of the Senegal Chapter of the Internet Society in the country. The video presented in Part 6 of this report is a video in which we explain the project and we specify that it is a project funded and supported by ISOC. This video was included in an article published in the leading online information site of Senegal(Seneweb). The video was also published on the site of the Ecole Supérieure Polytechnique in Dakar, which is one of the most prestigious engineering schools in Senegal.

Seneweb: http://seneweb.com/news/Societe/technologie-des-professeurs-connectent-l_n_212180.html

Ecole Supérieure Polytechnique: http://www.esp.sn/?p=3678

Other chapters could help to disseminate the project by sharing the video in their chapter or making articles about it and talk about its importance for some areas where communication is a need but people can't have it. The same pr

9. Any additional information that would be useful to the Internet Society community for purposes of an interim report.