Technicity final project, 2014
Created by Yari Sanfelice

Monitoring flooding river in Florence (Italy)

Intro

To better explain my idea and its evolution during the Technicity course, I divided this document in 2 part:

1. The first part is the project proposal; I wanted to maintain it “as is” to show my initial idea about flooding rivers;
2. Then, I go through the second part, namely the final project. I explain how I would use sensors and GSM technology; an App would be fit for the purpose of this project. Also, I come up with another idea: putting some light boards in strategic city zone to alert people who have no mobile phone on their own. By doing this, I think I can increase the efficacy of my project because it can warn more people rather than GSM station only.

Project proposal

Topic

The intent of my document is to better understand how technology can help people to save themselves against flooding rivers.

What

I wish to learn how sensors can record data regarding a river flow and how I can use they to provide to people a secure and promt communication via GSM network.

Why

I currently live near a river; often it floods and people have to leave their own houses to save themselves. After, people have to work hard to clean roads and buildings. Sometimes, someone dies, for example because he trapped in a car. I would like to help people to avoid all of that.

Where

Florence (Italy), the city I am living in.

Who/engage

This project relates to people who live near rivers; furthermore, I think it will be very helpful for authorities and rescuers.

How

a. **Data Collection and Analysis:** I am going to study the possibility to record water flow data by using buoy-sensors. Data are collected for monitoring, day by day, the water flow. Once data indicate an imminent flooding, an alert communication is sent via GSM network to all people having their mobile phone recorded on those GSM's cells that affect the flooding area.

b. **Design**: I would like to design a system for sending data captured by buoy-sensors along the river; data are sent wirelessly to a local radio base for storage and processing. The local radio base sends an alert communication, for example a SMS, through GSM network.

Project proposal – intro

With statistics indicating that, in Italy, from 1960 to date, more than 70 people died due to river flooding.
The most important river flooding occured in 1966 in Florence by the Arno river.

During the flood of the Arno river, unfortunately many people died.
Furthermore, the river damaged thousand of masterpieces; the city fell in the chaos. People became scared, and rescue operations were inadeguate. The city was unorganized to handle that disaster.
By reading documents relate to this fact, I realized that, most likely, people did not aware of the imminent danger.

A view of the Florence flood. People see, powerless, the Arno river floods buildings, roads, art.

http://it.wikipedia.org/wiki/File:Alluvione_di_Firenze_02.jpg

Quickly, citizens cleaned roads from mud, by cooperating each other to obtain a common goal: repossess
Florence.
To recover masterpieces, many people organized themselves by creating a “human chain”; hundred of masterpieces were rescued in this way.
They were called «Mud angels».

http://it.wikipedia.org/wiki/File:Alluvione_di_Firenze_04.jpg

http://it.wikipedia.org/wiki/File:Volontari_Firenze_1966.jpg

I would like to study in deep how technology can help cities having river flowing within it. I would like to help people to avoid any danger related to river flood.

I focused my attention on Florence (Italy).

http://tuscany.italy-trip.org/florence-photo.html

http://en.wikipedia.org/wiki/Tuscany

By having a look at below snap, we can see that the Arno river flows into Florence, crossing the historical centre also; there, many peole live and work.

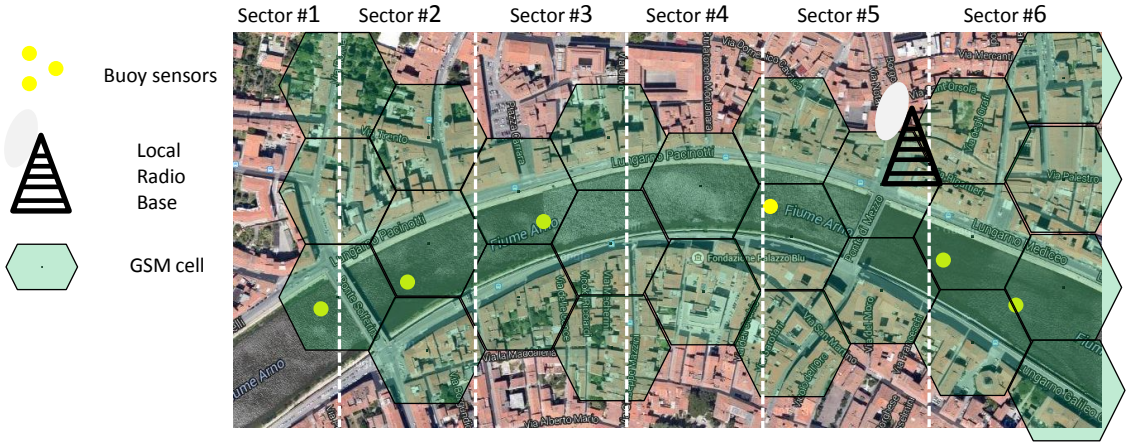
https://www.google.com/maps/place/Florence/@43.7849155,11.2034249,12z/data=!4m2!3m1!1s0x132a56a680d2d6ad:0x93d57917efc72a03

DESIGN

To better explain my idea, I would like to use an easy example using just 2 steps.

Step 1

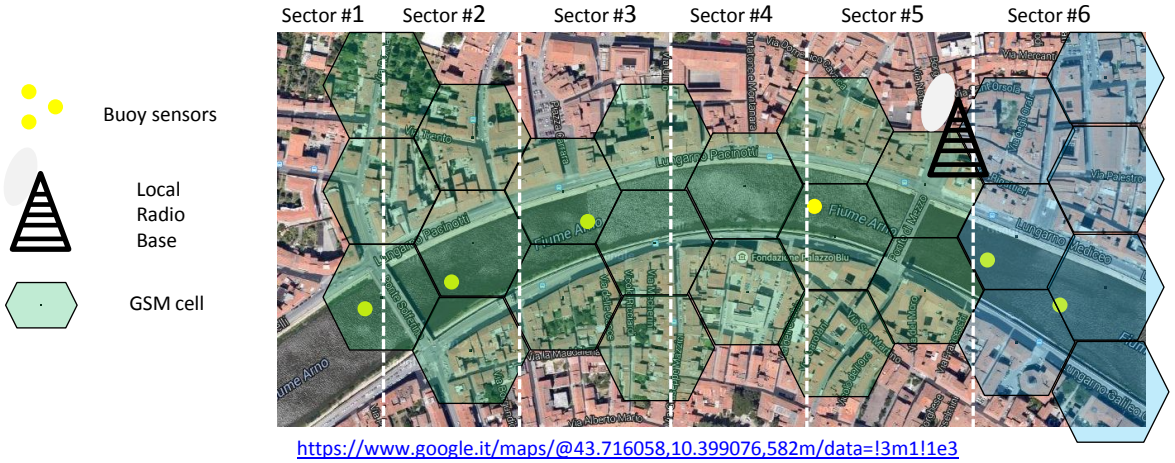
Some buoy-sensors monitor the river flow; data are sent wirelessly to a local radio base for processing and storage.



https://www.google.com/maps/place/Florence/@43.7765497,11.2316202,2178m/data=!3m1!1e3!4m2!3m1!1s0x132a56a680d2d6ad:0x93d57917efc72a03

Step 2

The sensors observe an abnormal flow, say in sector #6; the local radio base sends an alert message (e.g. SMS via GSM network) **to people having their mobile phone registered on blue GSM cells only;** this because blue cells are nearest the unsafe place.
This let people to leave places near river to make themselves safe before the river floods.



https://www.google.it/maps/@43.716058,10.399076,582m/data=!3m1!1e3

RESUMING

This document showed the way I am interesting in by using a buoy-sensors in the river for monitoring the water flow.
Data collected are sent to a Local Radio base for processing. If data indicate that a set flow value is forecast to exceed that value, the local radio base send an alert communication through GSM network.
To be useful, the alert communication is sent to those mobile phones that are registered on those GSM's cells just over the flood area.

ADVANTAGES

Giving a prompt communication to all people that are in risk to be involved in a river flood; my idea would let them more time to leave risky places; furthermore, it makes easier rescuers task by managing rescue operations concentrating their effort for other things, for example to save buildings, masterpieces, art and so on.

Final project

Topic

The intent of my document is to better understand how technology can help people to save themselves against flooding rivers.

What

By designing my project, I learned a lot of things about rivers, orography in general, sensors and GSM technology. I learned also how difficult is to contact politic people and citizen administrators for finding information due to their tasks.

Where

Florence (Italy), the city I am living in. The river I am interesting in is Arno.

Who

This project relates to people who live near rivers; furthermore, I think it will be very helpful for authorities and rescuers. During my project, I interviewed some people by asking them how they feel to live near a river, if they have fear and what they think about my proposal. Their feedback were useful for my project to increase its functionalities.

How

For my project I prepared a .pdf document in which I show through what I mean by Technicity in my own city. Nowadays I guess technology can help people to live more comfortable and in safety; I think also that everybody can do a lot for improving their cities by sharing ideas to local community.

a. Data Analysis: I searched information about flooding in general on the web to better understand the phenomenon; after, I came up with my idea to use floating sensor on the river and GSM technology to alert local communities that the river is expecting flood. Eventually, I interviewed people (15 roughly) who live near the Arno river to understand their feedback about my idea.

b. Design: Basically, my idea would use:

•sensors to monitor the river flow and/or the river height (e.g. buoy sensor);
•central processing unit to collect and to analyze sensors' data (sent wirelessly);
•GSM local base to send alert communication (SMS, phone call and so on) to all people having their mobile phone recorded on those GSM's cells that are near the flooding area.
•Light boards to display alert messages (GSM activable)

BUOY SENSOR

http://en.wikipedia.org/wiki/File:NOAA-smartbuoy2.jpg

Central processing unit

http://www.tomshw.it/cont/articolo/motherboard-x48-da-asrock-dfi-ecs-e-intel-a-confronto/22089/1.html
http://www.bajet.my/home/server.php

KEY ELEMENTS

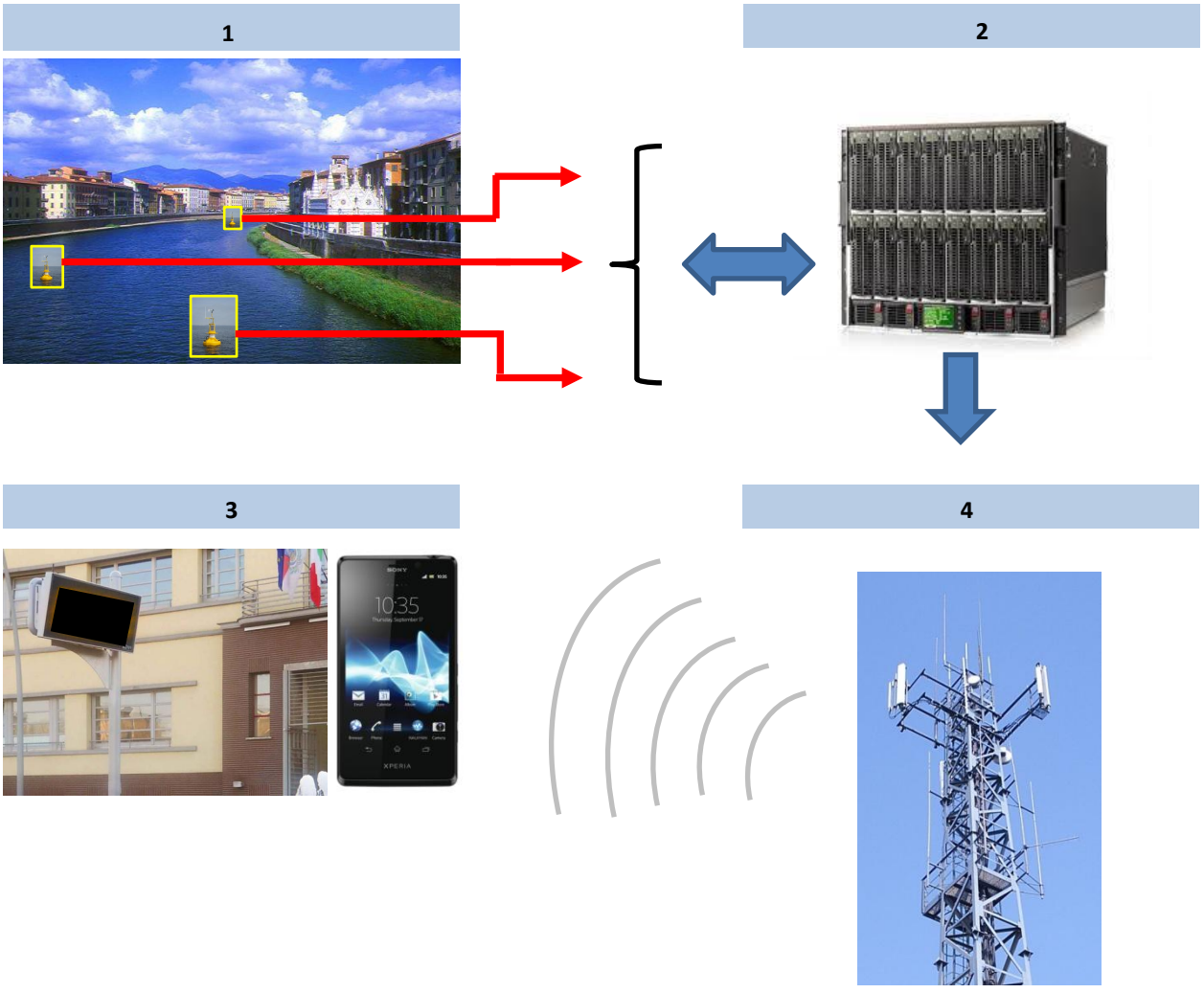
GSM local base

http://it.wikipedia.org/wiki/Cell_broadcast

GSM Light board

http://www.aesys.com/it/display-a-led-e-monitor-TFT/autobus/sistemi-di-terra

HOW IT WORKS



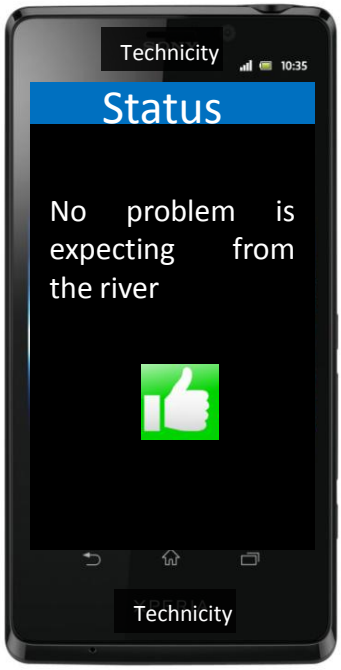
(1)The sensors monitor the river flow/height and they send wirelessly data to the central processing unit .
(2) The central processing unit stores and elaborates data; when data indicate that a flood is expected, the central processing unit sends to the GSM local base an activation signal.
(3) The GSM local base then, sends an "*alert*" communication to all people having their mobile phone recorded on those GSM's cells that affect the flooding area.
(4) Besides mobile phones, the GSM local base sends an "alert" message to those light boards which are near the expected flood zone; this allows people without mobile phones to "*see*" the alert communication to make themselves safe.

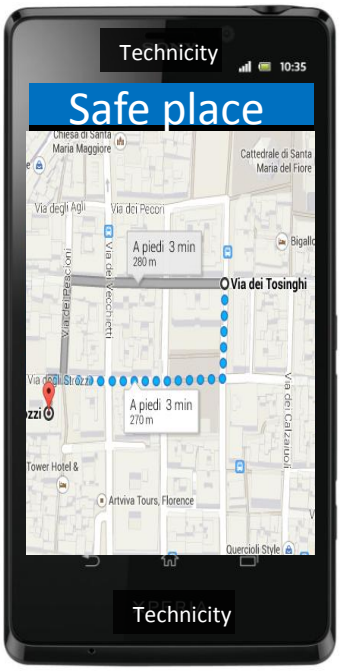
http://online-safety-program.com/

App – a proposal

To make my project more “user friendly”, I would like to develop an App for smartphone to keep people updated about, for example:

•River status and level (no problem, rising level, guard, alert, danger);
•Location of the “safe zone” to find rescuers by GPS.





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