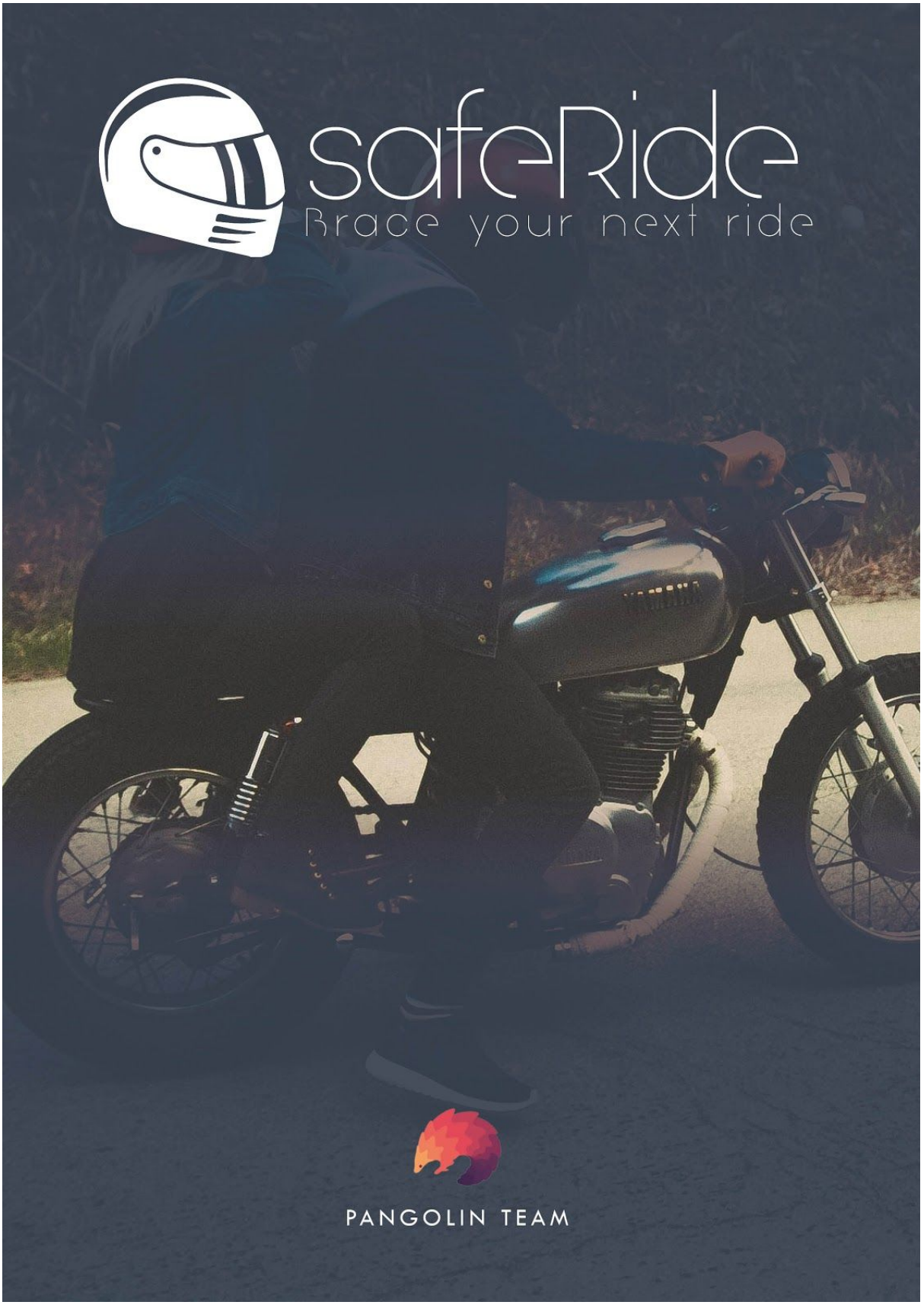

safeRide
Brace your next ride
PANGOLIN TEAM

SafeRide

Our safeRide concept makes part of a new connected helmet generation. We see it as the only full usable solution in all crash cases. In facts, our helmet will assure all the support and the emergency for you. Conscientious or uncontentious, it will be able to contact rescue services at the second it detects the impact. Implemented by sensors, captors and a sim card, this helmet is at the cutting edge of technology. Design, compact and ergonomic, the detector housing will be invisible and perfectly aesthetic.

The operation of safeRide rescue device is to inspect the strength of the shock using different sensors to avoid false alarm and immediately contact emergencies. It does not require your phone if you are stuck or incapacitated to use it thanks to the incorporated card. This project is an all case solution completely optimal that allowed the wearer to be take in charge in every situation.

State-of-the-art

Some connected helmet already exists today, but we didn't find any helmet like the one we think we will develop. Some of these have GPS, vocal command, heads up display, to give some examples:

● Apple Watch & iPhone SOS functionality

● Quin: only sends your location to your family

● Jarvish X-AR: to get additional information on a head-up display using holographic

technology

None of the previous product can call the emergency services directly if it detects impact or accident and transmit localization thanks to GPS chip to help rescue services to arrive quickly and save time to save lives. We aim to bring this safety feature to your everyday ride.

Components list

Due to some constraints (like the cost constraint), we chose Arduino UNO and changed a little bit what we aimed to do, not all the sensors we wanted were available so we had to adapt our project and the used components to achieve it. We have been using :

- Arduino Uno use to link all element together;
- Ultrasonic sensor to detect proximity vehicle;
- Alcohol sensor to test if the driver can drive linked to a led which indicate if the level is ok. Led off is level is ok or led on if level is not ok;
- A vibration sensor which detect shock and communicate with the arduino;
- A GSM module to send the position of the driver if an accident happen;
- An sos button on the helmet if the driver is still able to react and move to prevent his relatives.

Disadvantages about what we wanted to do :

- Arduino Uno + GSM module take a lot of place confront to the LinkitOne card which have GPS and GSM included.

Our approach

After working with the arduino during the labs, we aim to create our own project using a microcontroller. To create a smart helmet able to automatically call the emergencies we wanted to use a “linkit one” with an accelerometer sensor. This approach would have reduced the size of the "SafeRide" module since the "linkit one" includes all the necessary components.

Since we had to use the Arduino Uno instead and all the components were not available to be shipped within acceptable delay, we decided to adapt our concept going further and rethinking everything from how we detect accidents to what new functionalities we could add.

We came out with an safeRide helmet allowing to work on both aspects :

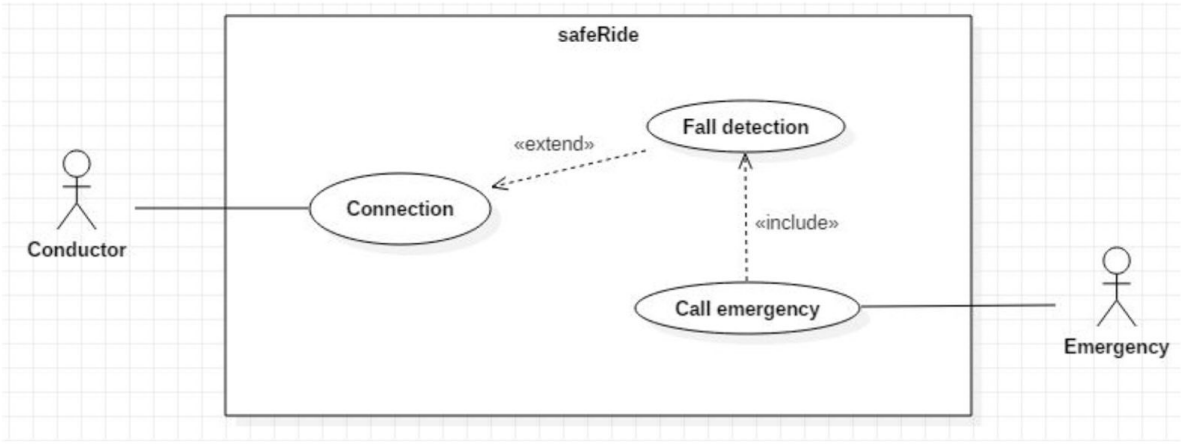
- Prevention : with an ethanol sensor able to detect if alcohol level is too high. We aim to place this sensor in the Helmet to determine the alcohol level of the driver and indicate with an bi color led. The red light indicates higher alcohol level and the yellow led indicates moderate alcohol level or below permissible level.

- Driving assistance : with an ultrasonic sensor the safeRide Helmet detects the close proximity vehicles. The goal is to place it behind the helmet in order to, for a next version, alert the driver about fast approaching vehicle through a buzzer or led or vibration motor (just like a 'Spidey Sense').

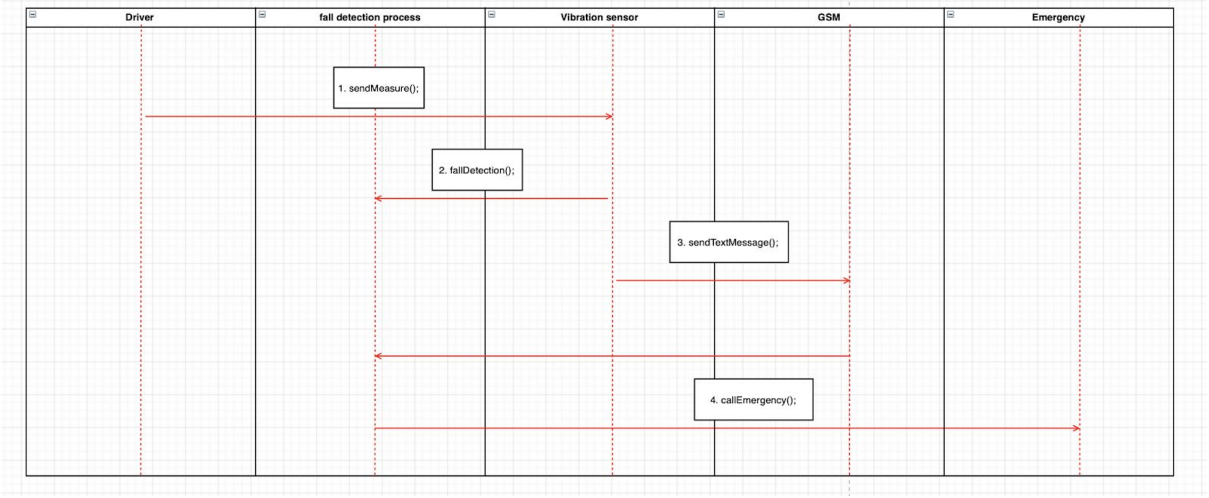
- Accident detection : In case the rider meets with an accident the vibration sensor detects the vibration and triggers the GSM Shield mounted over the Arduino Uno to send an SMS to predefined numbers to call for Help. A MINI A8 gps/gsm tracker is placed with the helmet in order to find the location of the accident. It sends the location once requested from the registered mobile number.

UML diagram

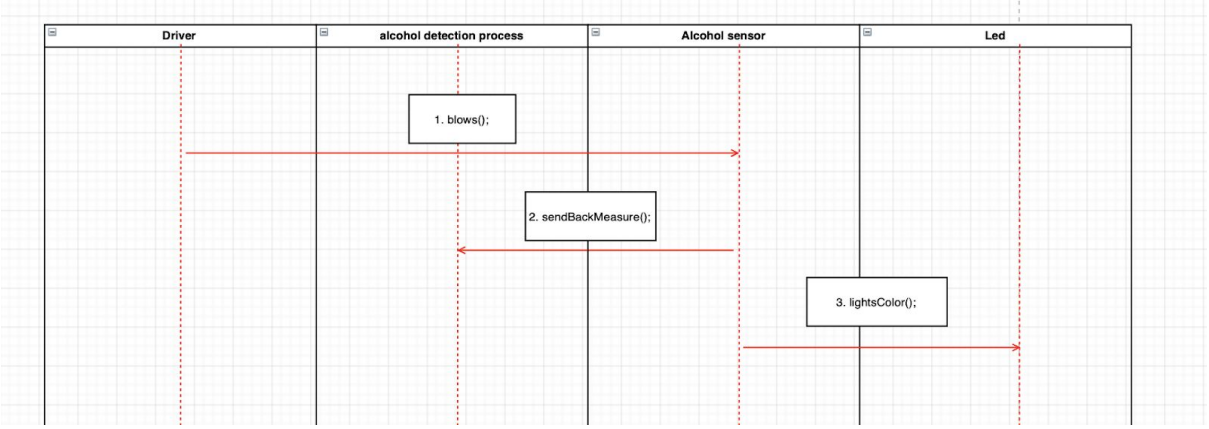
Use case :



Sequence diagram fall detection :



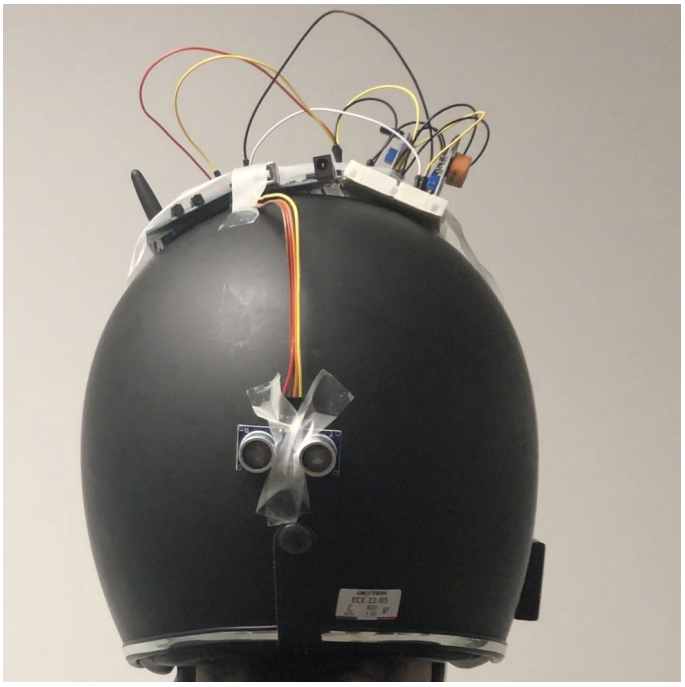
Sequence diagram fall detection :



Technical approach

We decide to connect one by one sensor at first to be sure that sensors we command work. Then, we gather the code and test all sensors together to keep the certainty that everything work well.

Final model



This is the final picture of the sensors implemented within the helmet. It looks bit awkward but can be neatly embedded by drilling the ultrasonic within the helmet and using smaller arduinos. We can imagine on the long term that solar panels would charge the incorporated battery.

SIM900 GPRS Module

Unfortunately the GSM module which was suppose to send a SMS to emergency or to a trusted contact isn't working properly. And we were not able to make it work despite looking at different tutorials or forum and the official manual of the module.

These are some examples of commands when we were trying to make it work :

```
Initializing...
AT

OK
AT+CSQ

+CSQ: 10,0

OK
AT+CCID

89331032160796569454

OK
AT+CREG?

+CREG: 1,2

OK
```

This is the first command to make sure the Arduino is connected to the SIM900 module.

This command shows the strength of the signal which range is between 0 and 31.
We can see that the module is indeed receiving a signal with a strength of 10.

Here is the ID of the SIM plugged in the module.

This command tells us whether the network is connected or not. According to the official manual, the "1" tells us that the network registration is enabled. And the "2" that it's not registered to any network but is searching for an operator to register to.

```
AT+COPS=?

+COPS: (3,"F-Bouygues Telecom","BYTEL","20820"),(3,"Orange F"
```

This shows us that the GSM module is indeed detecting signal from different operators like Bouygues or Orange.

```
AT+COPS?
+COPS: 0

OK
```

If the module was connected to a network, this command should have shown us to which operator it's connected. Currently it's not connected to any operator.

```
AT+COPS=1,0,"F-Bouygues Telecom"

+CME ERROR: PLMN not allowed

+CREG: 3

+CGREG: 3
```

So now we're trying to manually connect the module to an operator.
The "1" is for the manual mode, "0" is the format of the operator's ID and then the operator's ID.
"PLMN not allowed" means that the operator is not allowed and the next two lines are an error code which means the operation is not allowed.

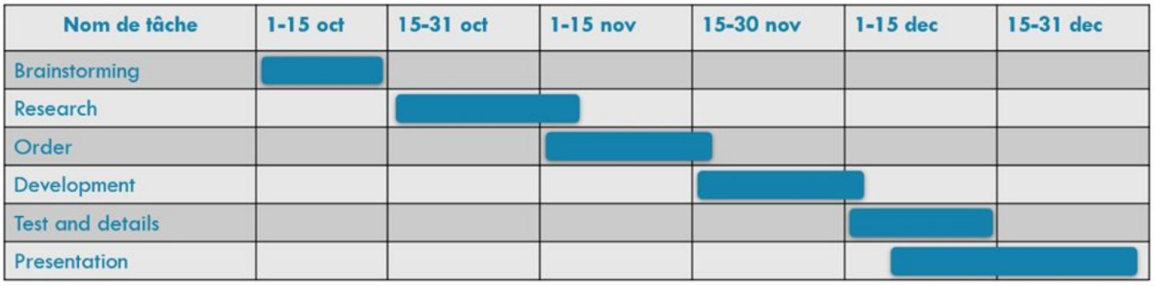
So we can't make it work, and the few times we indeed connected it to a network the Arduino code to send a SMS was supposedly working but we never received the text. And the module quickly disconnected itself after trying to send the SMS.

Here's the link to the official manual which helped us to understand the commands and the meaning of error codes : https://www.espruino.com/datasheets/SIM900_AT.pdf

Norms and regulations

Implements some sensors in a helmet is obvious a problem about norms and regulations.
Norms about helmet : norm NF (NF S 72.305) and many others.

Gantt diagram



Conclusion

The safeRide project in its concept seemed, at first sight, exciting both in its purpose and in its functioning and, for this first part, it turned out to somewhat challenge us in a surprising way in its form, since we had to adapt to the constraints.

The main difficulty, or in other words the least pleasant part, that we have encountered is that corresponding to the GSM module allowing to make call and send text message because even though everything seemed right it didn't work all the time. We understood later that some telephonic operators can't work with our GSM module, and we could not order a new one before deadline.

Our project being challenging and dense in functionalities, it helped us practice and was instructive prompting us to take an interest in the different concepts covered in class.

The purpose of the project is attractive, it was a source of motivation to move forward and the experience acquired with previous labs allowed us to do it more effectively, in a more organized way.

PANGOLIN TEAM

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