

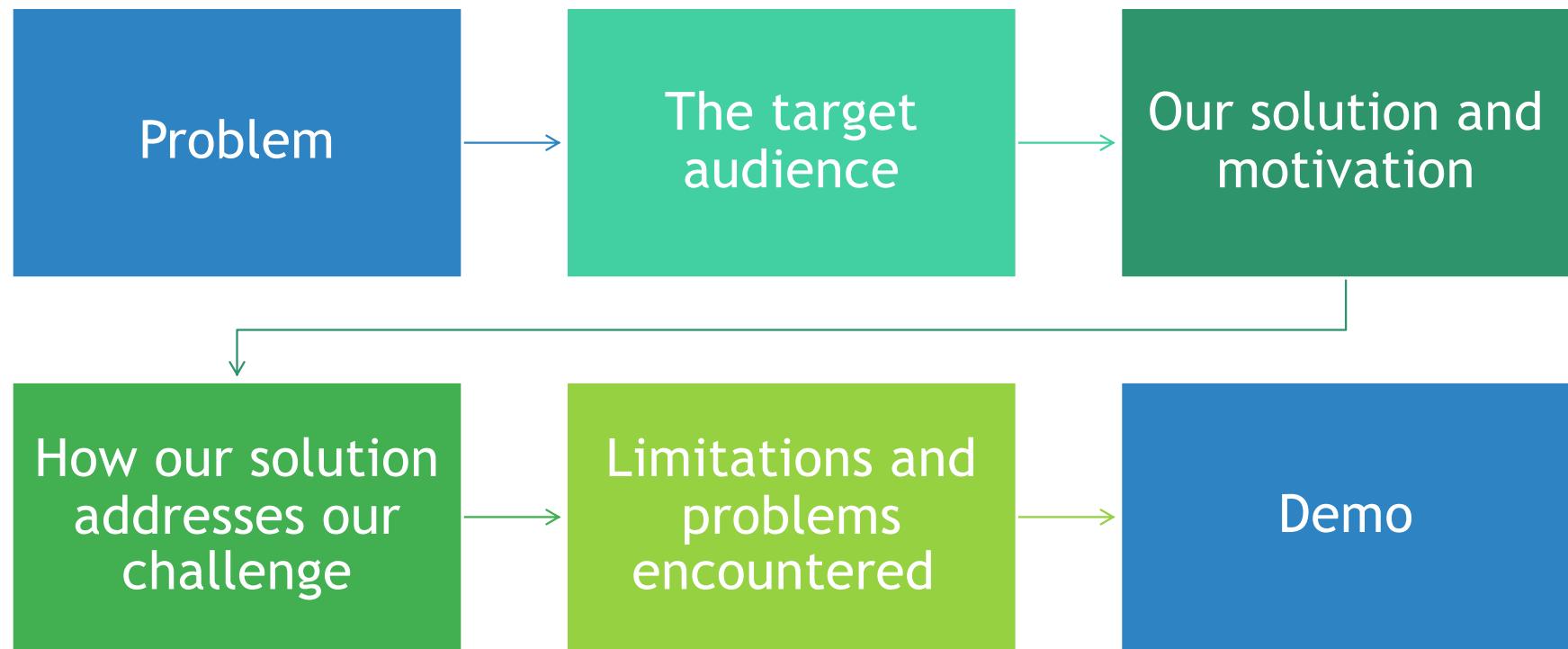
# Advanced Human Machine Interaction Project: Multimodal Smart Cane

Presented by

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## Summary :





## Problem

→ People with visual impairments represent a significant proportion of the global population. It is estimated that at least 2.2 billion people have some form of vision impairment.

→ It is therefore essential to develop solutions that meet their needs and improve their independence



## The target audience

### Blind people



### Visually impaired people



Particularly those who are on the move: in urban environments, in situations where obstacles or hazards may arise, and who require non-visual assistance.



# Our solution and motivation



- ▶ The goal of the project is to develop an adaptive smart cane designed to improve spatial awareness and safety for visually impaired people.
- ▶ The cane is based on two main sensors: an Intel RealSense D435 depth camera and a USB microphone



## Our solution and motivation

- ▶ The data from these sensors is processed in real time by a Raspberry Pi 3.
- ▶ User feedback is provided by three vibrating motors and the intensity of the vibrations indicate the proximity of the danger and guide the user as they move
- ▶ Arduino will be used as an interface between the central processing (Raspberry) and the physical actuators (vibration motors)



# How our solution addresses our challenge ?

- ▶ *The vibration intensity reflect the proximity of the danger allowing the user to interpret the environment with the haptic output.*
- ▶ *Improve their perception of their surroundings and increase their safety in the face of potential obstacles and dangers.*



# Limitations and problems encountered

## → Performance issue:

*The initial Raspberry Pi 1 was not powerful enough to handle the processing requirements.*

## → Configuration Issue:

*Setting up the Raspberry Pi proved to be more challenging than anticipated.*

## → Complex installation of the RealSense camera :

*Intel RealSense Python library required to clone the library from GitHub and build it from source.*



## Limitations and problems encountered

→ **Difficult sensor synchronization :**

*The synchronization of the data from both sensors has been challenging.*

→ **Hardware problems with vibrating motors :**

*The vibration motors have temporarily been replaced with LEDs for testing purposes due to a voltage issue. Moreover, the brightness of the LEDs was not entirely reliable.*



→ **No environment tests were conducted:**

*Due to limited time, even though the device is still a prototype and tuning the code parameters could have significantly improved the user experience.*



# Demo





## The end and FAQ



► Thank you for listening!