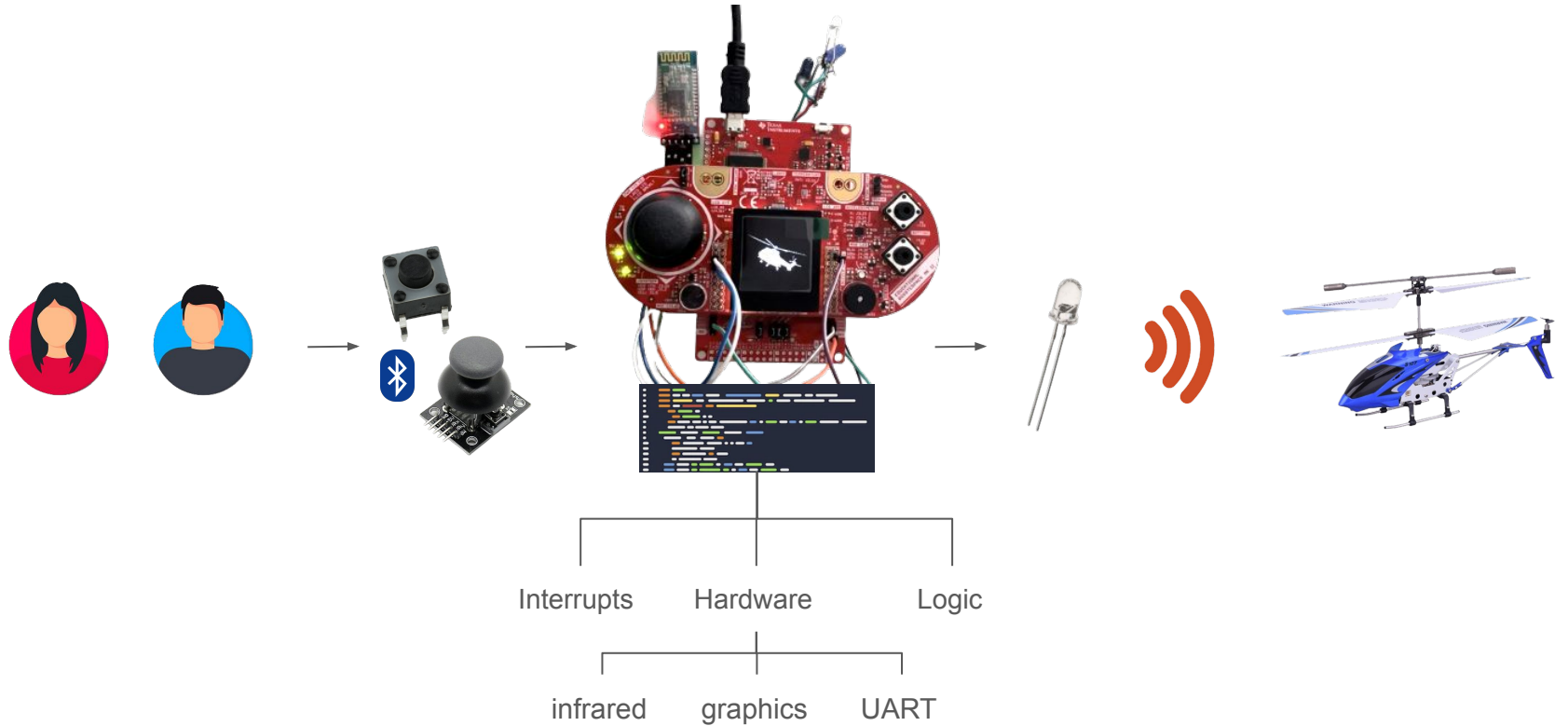




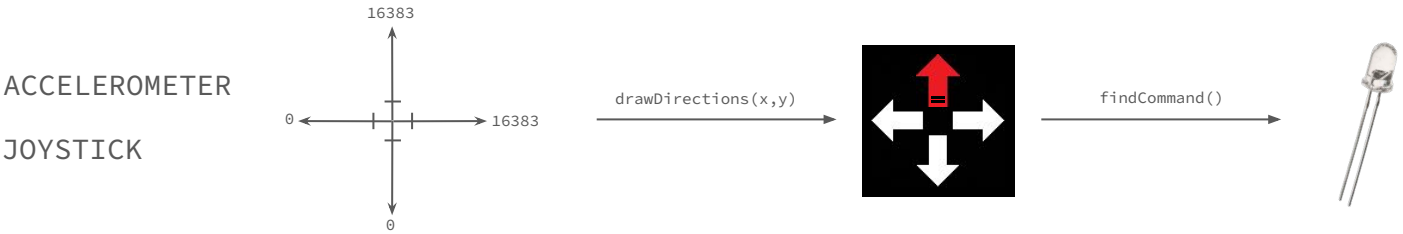
# HELICOPTER CONTROLLER

Implementation of an infrared controller for a helicopter using MSP432

# System basic workflow



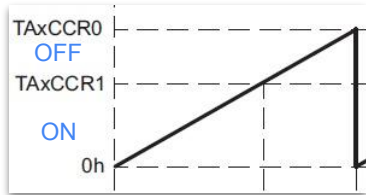
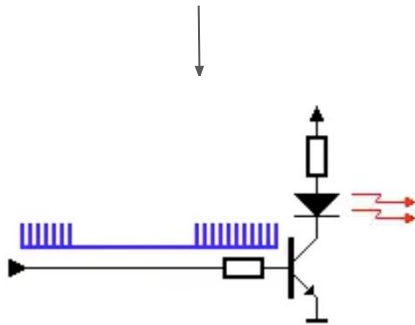
# Software architecture



# Code highlights

## Infrared:

```
const uint16_t command[MAX_PULSE] = {1950,250,400,250, ...}  
const uint16_t command_p[MAX_PULSE] = {1950,200,750,200, ...}
```



## Graphics:

```
typedef struct {  
    unsigned char BPP;  
    unsigned int XSize;  
    unsigned int YSize;  
    unsigned int NumColors;  
    const unsigned long * pPalette;  
    const unsigned char * pPixel;  
} tImage;
```

Defined in <grlib.h>



For two-colors images pixels can be represented with 0 and 1 (black and white) and the full image can be written as a sequence of strings like these: 0b00010111, 0b00110101 ...

From png to RRRGGGBB (8bpp): <https://notisrac.github.io/FileToCArray/>

From 8bpp to 1bpp: this simple python script

```
with open('read.txt') as file:  
    values = file.read().split(",")  
  
result = ""  
printed_values = 0  
for value in values:  
    if value.startswith("0x0"):   
        result += "0"  
        printed_values += 1  
        if len(result) == 10 or printed_values == 76:  
            result += ", "  
            if printed_values == 76:  
                printed_values = 0  
                print(result)  
            else:  
                print(result, end = ' ')  
        result = ""  
    elif value.startswith("0x1"):   
        result += "1"  
        printed_values += 1  
        if len(result) == 10 or printed_values == 76:  
            result += ", "  
            if printed_values == 76:  
                printed_values = 0  
                print(result)  
            else:  
                print(result, end = ' ')  
        result = ""
```

# Testing

MSP432\_Project/Logic/test.h

- command sender testing
- timers testing
- graphics testing
- Bluetooth testing

```
12 #include "Logic/project_logic.h"
13 #include "Hardware/Graphics/direction_graphics.h"
14
15
16 #define TEST 0 // set to one to begin test session
17
18 extern uint8_t test_command; // set to 0 to get the
19
20 extern uint16_t n_loops_timer_id; // used for timer
```

# Improvements

- Improve the IR transmitter range by providing more current through a transistor
- Add voice control through TinyML voice pattern recognition
- Add an accelerometer module and a basic communication system to send data to the MSP432 board and compute (and display) the altitude and speed data of the helicopter.