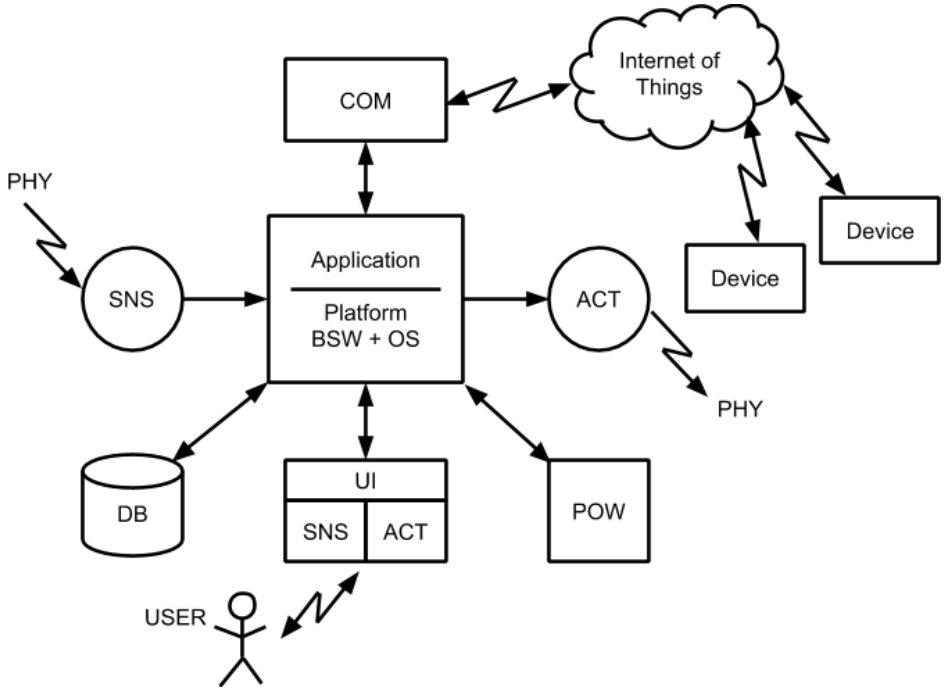
Интернет вещей

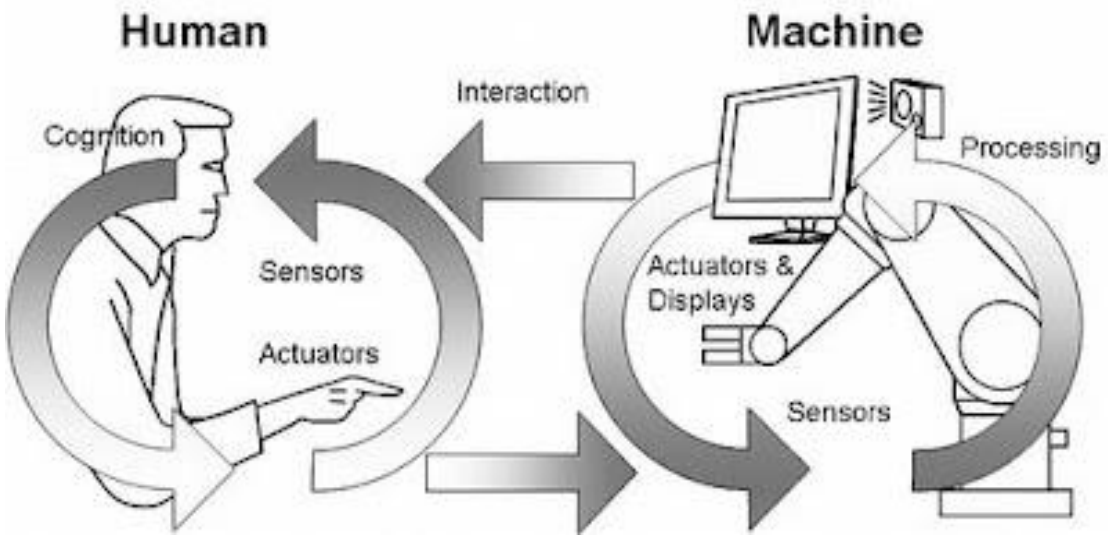
Взаимодействие с пользователем

Типы взаимодействия

- Взаимодействие с пользователем
- Взаимодействие с окружающей средой
- Взаимодействие с устройствами(IoT)



Обмен пользовательской информацией с системой

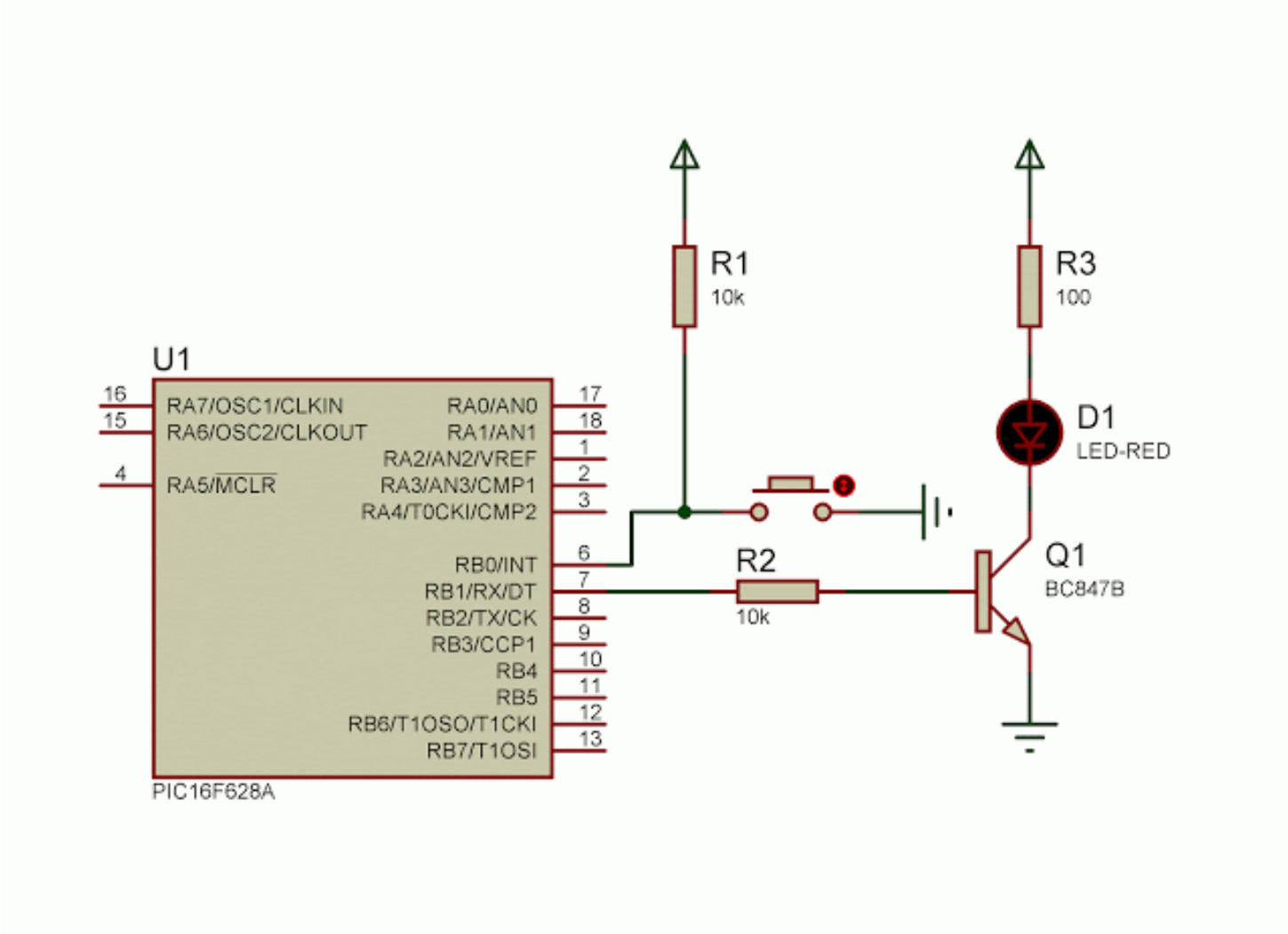


- Бинарные интерфейсы
- Масштабируемые бинарные интерфейсы
- Цифровые интерфейсы
- Стандартный интерфейс STDIO
- Аналоговые интерфейсы
- Сложные интерфейсы

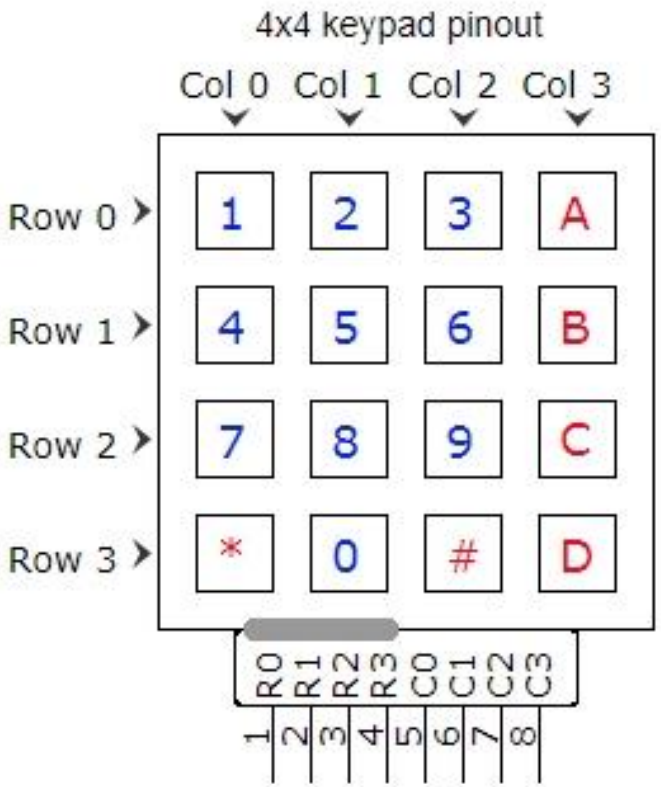
Персональный компьютер- PC

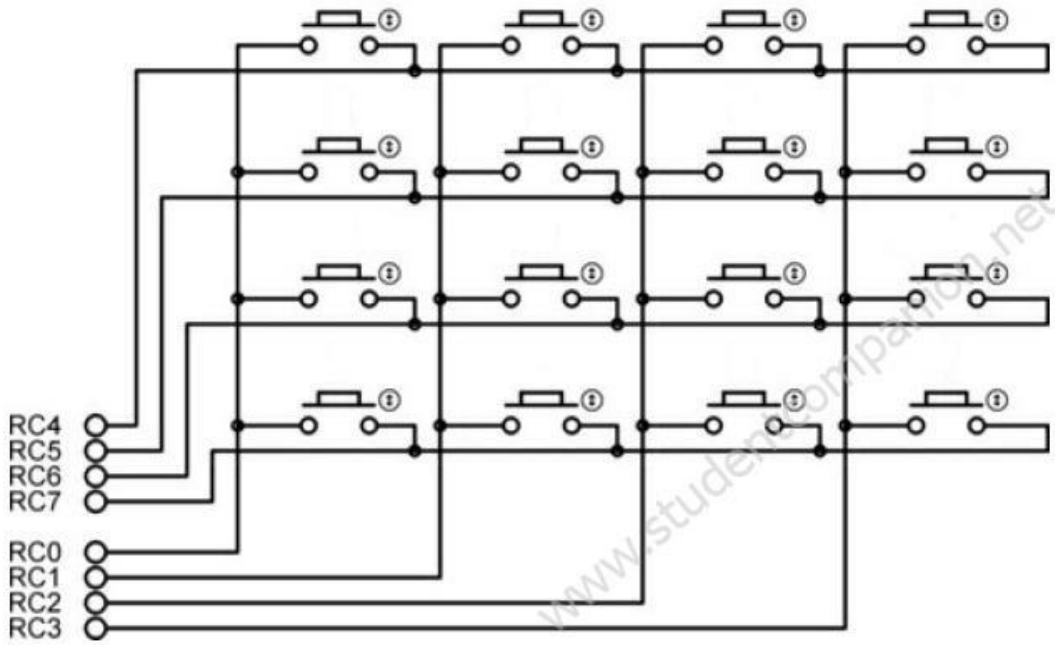
Взаимодействие с ПК

Бинарные интерфейсы– Buton / LED

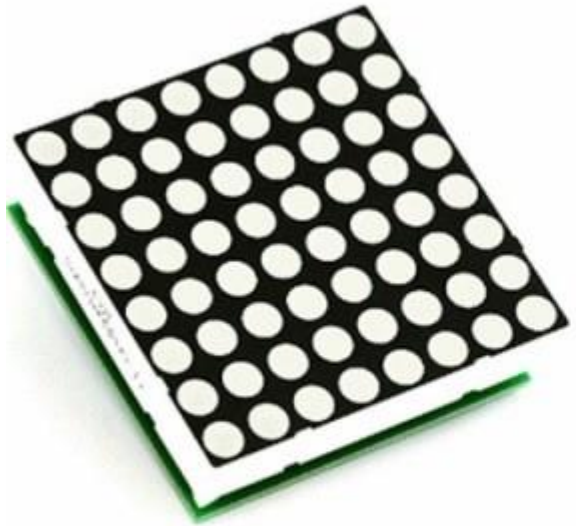


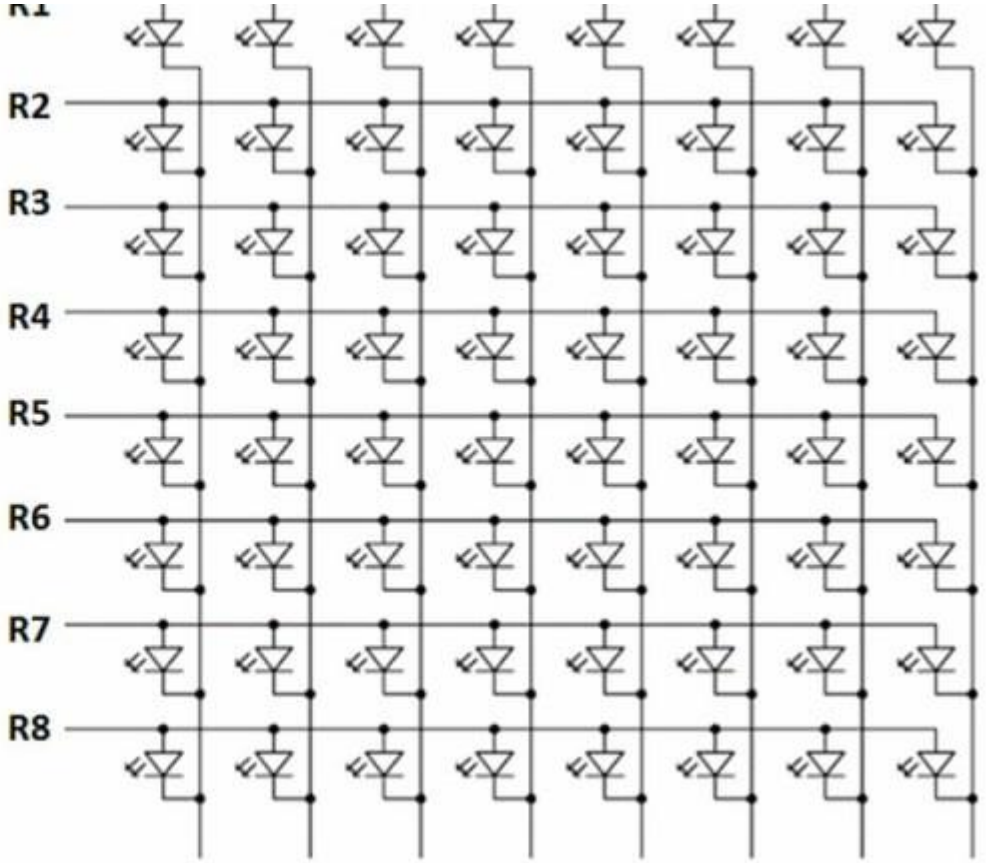
Кнопочная матрица



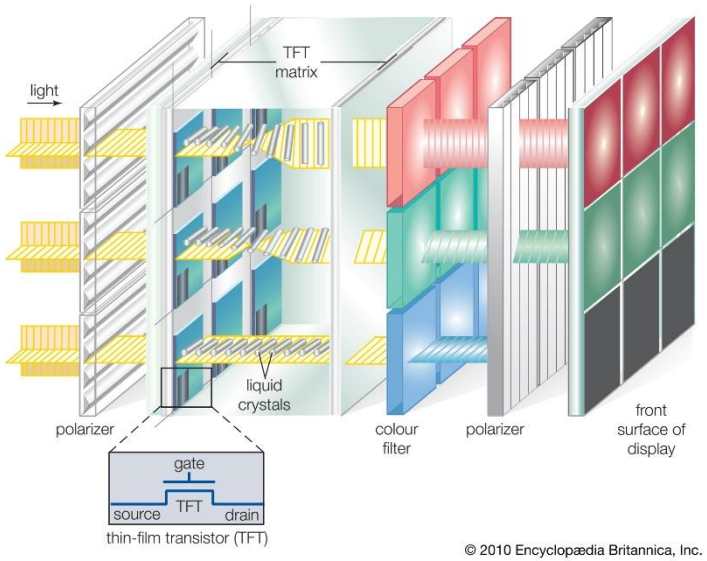


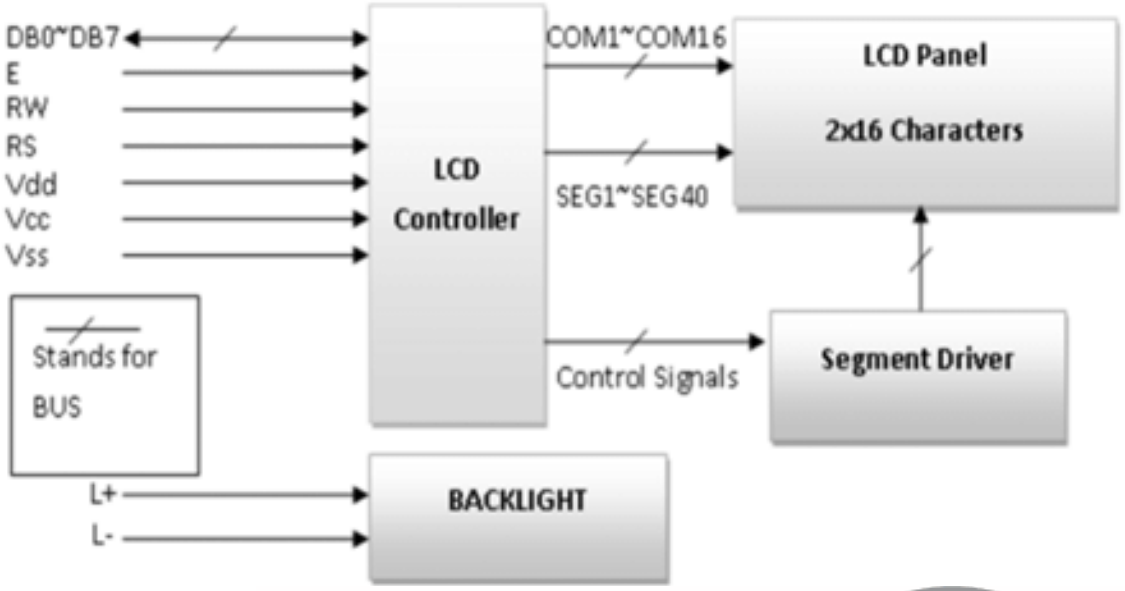
Матрица LED

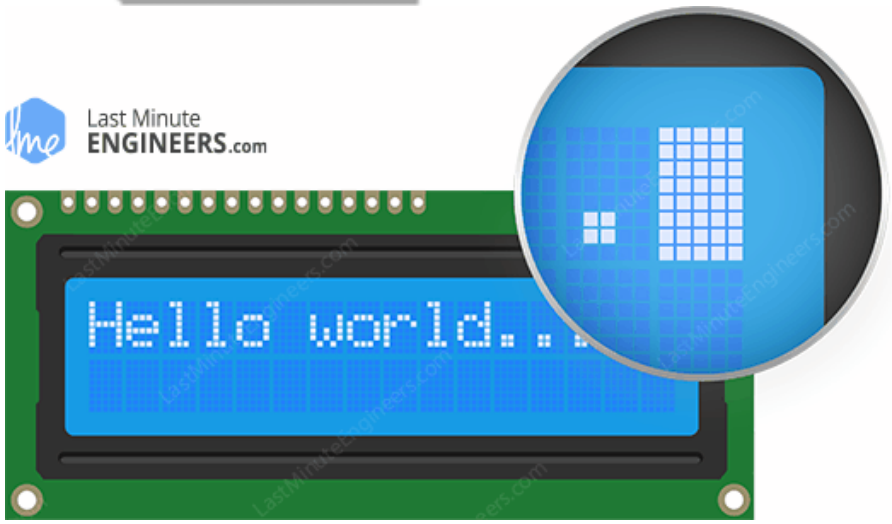




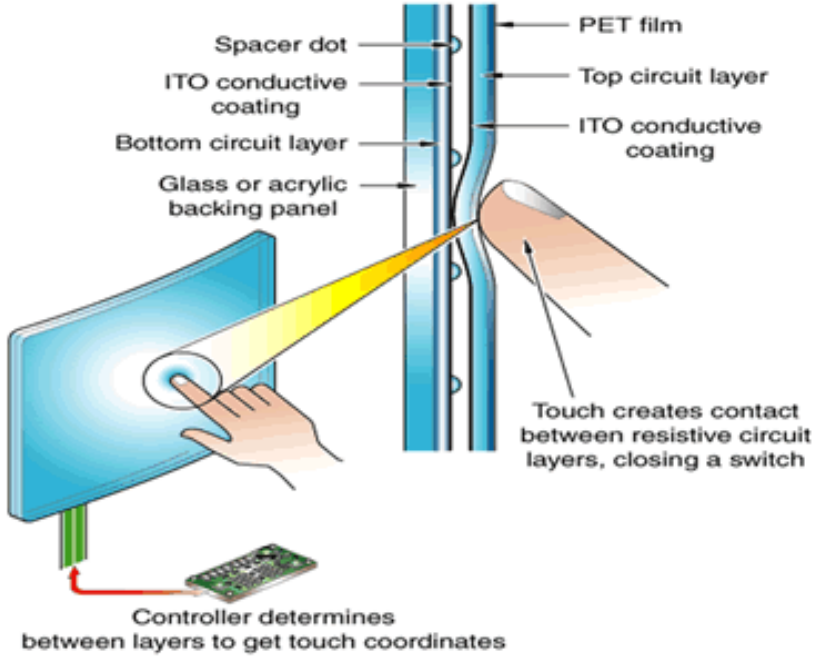
Матрица LCD

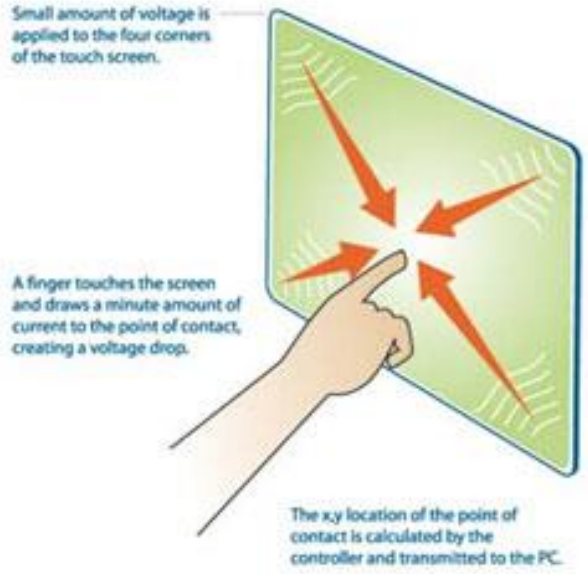

light
TFT
matrix
liquid
crystals
polarizer
colour
filter
polarizer
front
surface of
display
gate
source
TFT
drain
thin-film transistor (TFT)
© 2010 Encyclopædia Britannica, Inc.

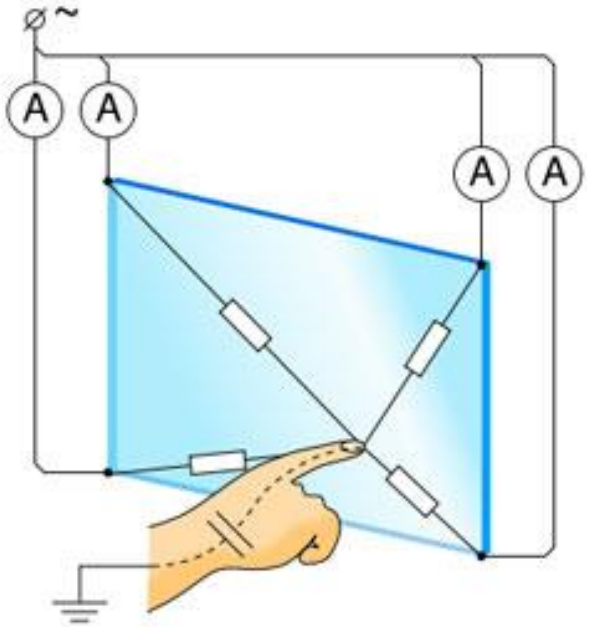

DB0~DB7
E
RW
RS
Vdd
Vcc
Vss
LCD
Controller
COM1~COM16
SEG1~SEG40
LCD Panel
2x16 Characters
Segment Driver
Control Signals
Stands for
BUS
L+
L-
BACKLIGHT


Last Minute
ENGINEERS.com
Hello world...

Резистивный сенсорный датчик





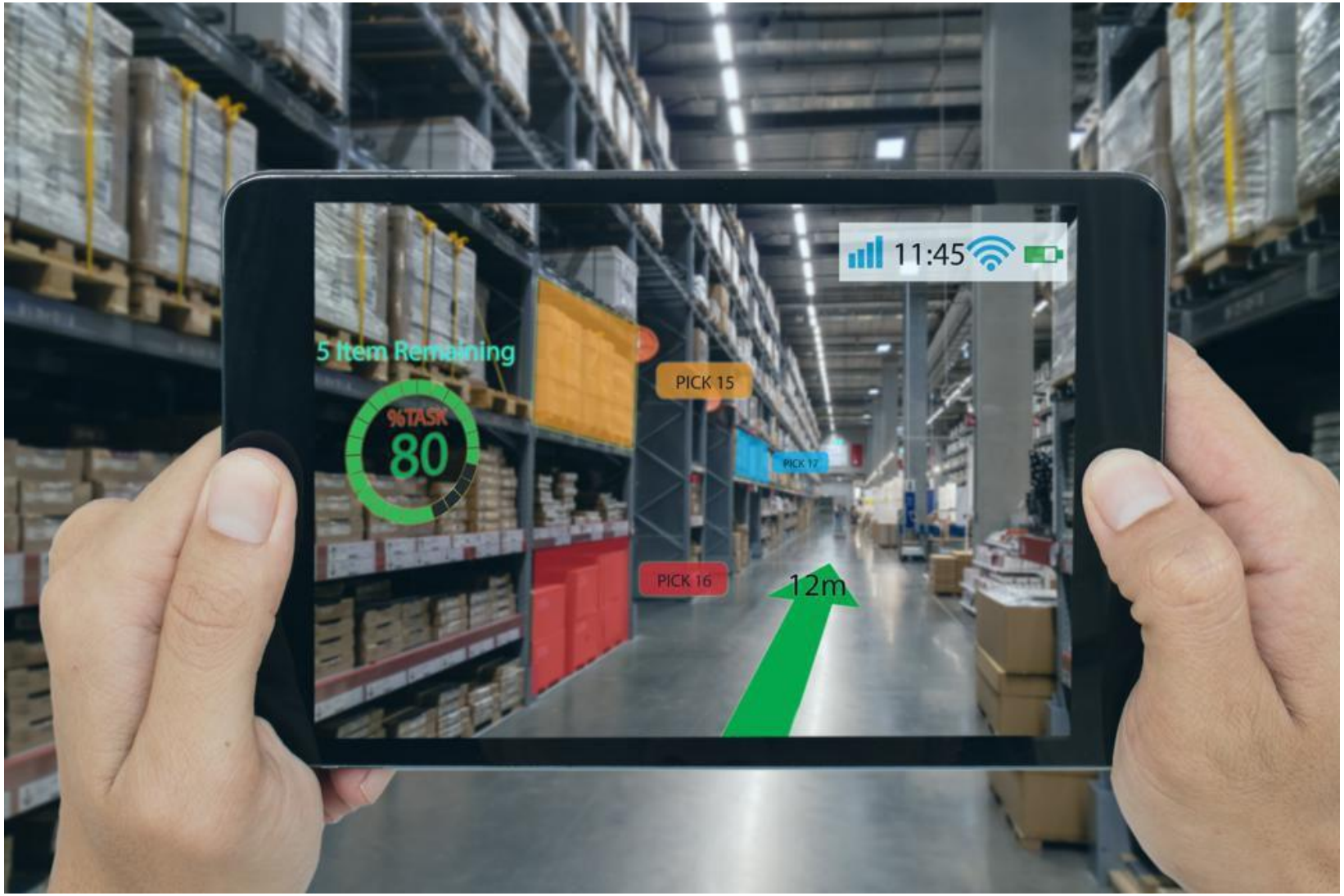


Тактильные взаимодействия

Разновидности

Виртуальная реальность

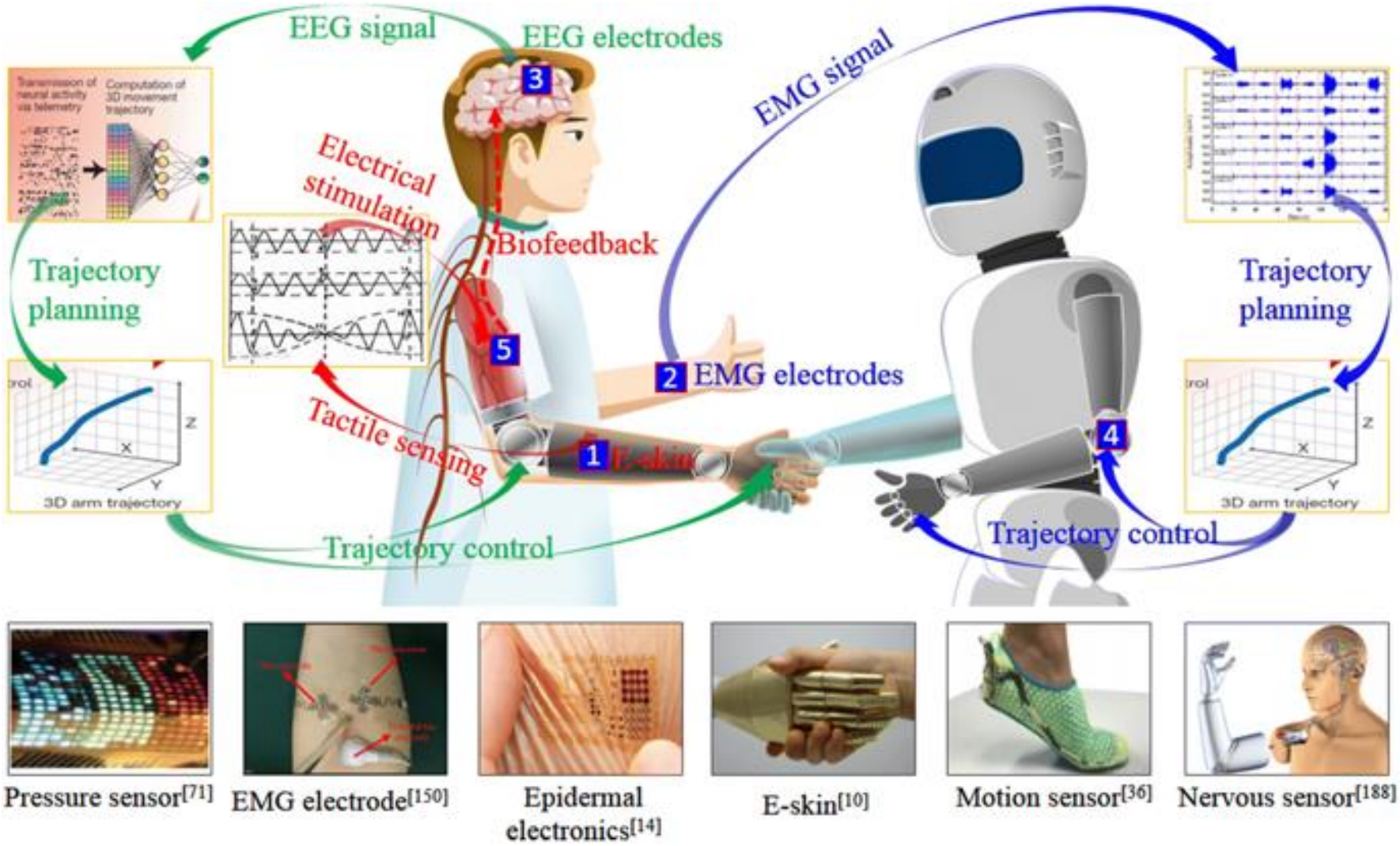
Дополненная реальность



Визуальные взаимодействия

Голосовое взаимодействие — умные колонки

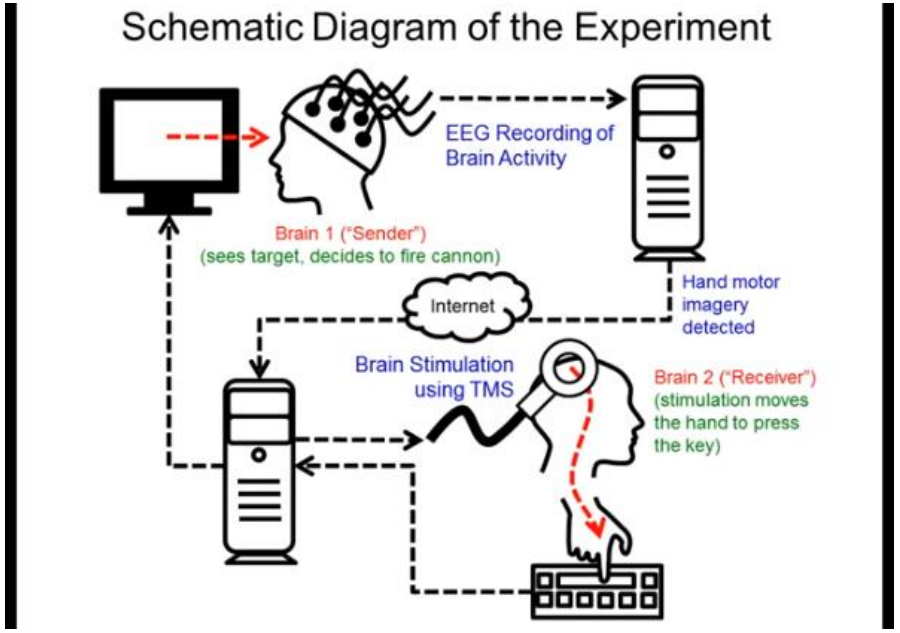
EMG Human Machine Interface



EEG – Human Machine Interface

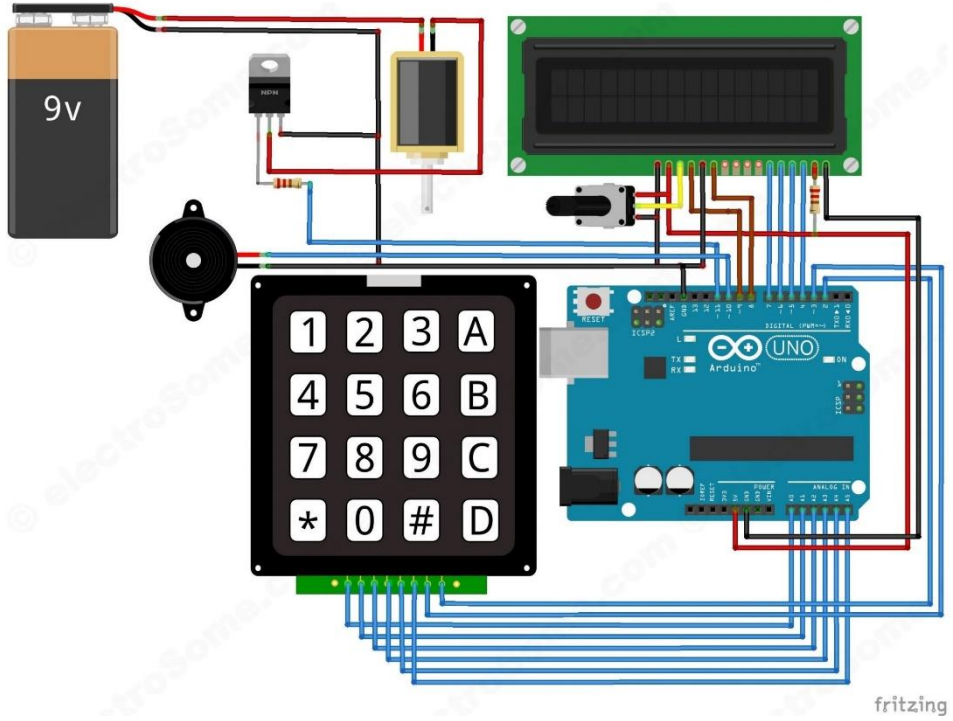
https://youtu.be/rNRDc714W5I

Researchers create first ever human-to-human interface, use it to

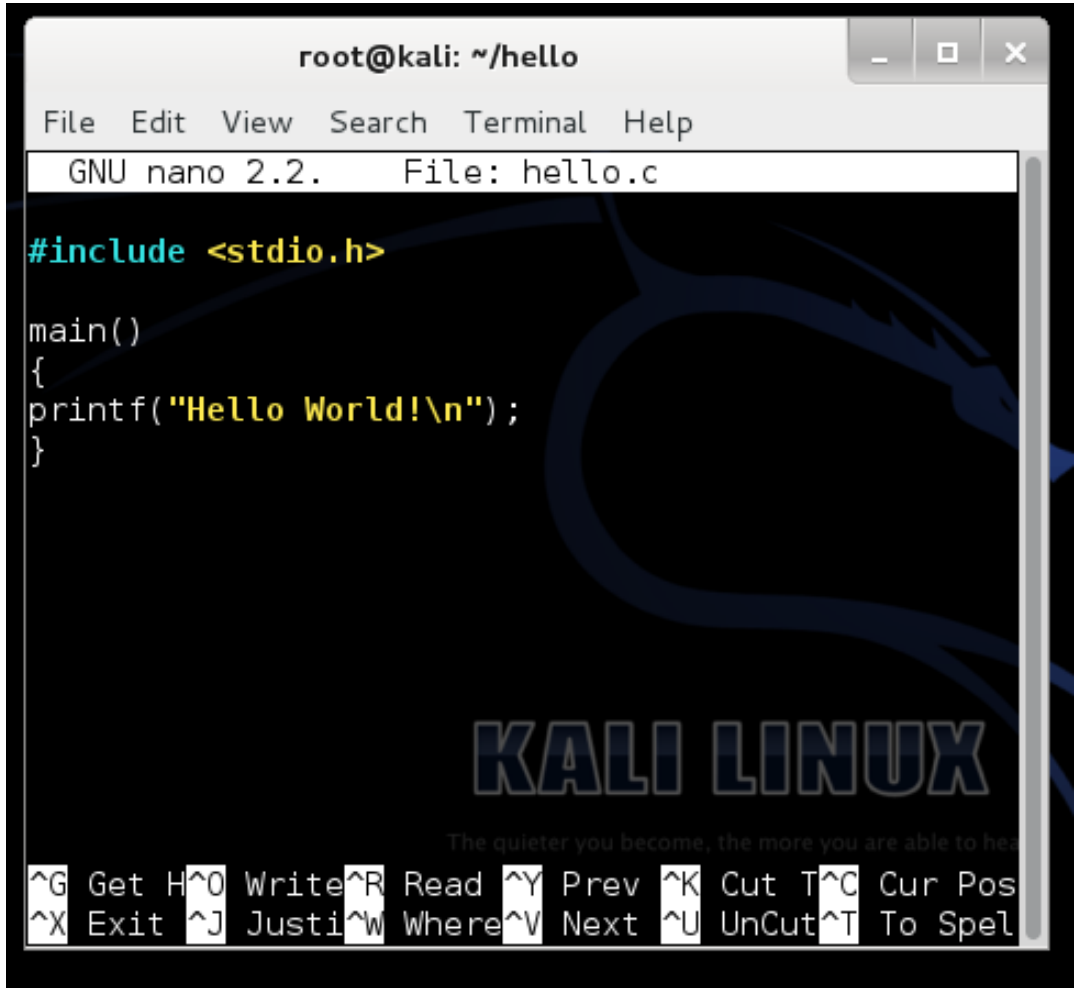


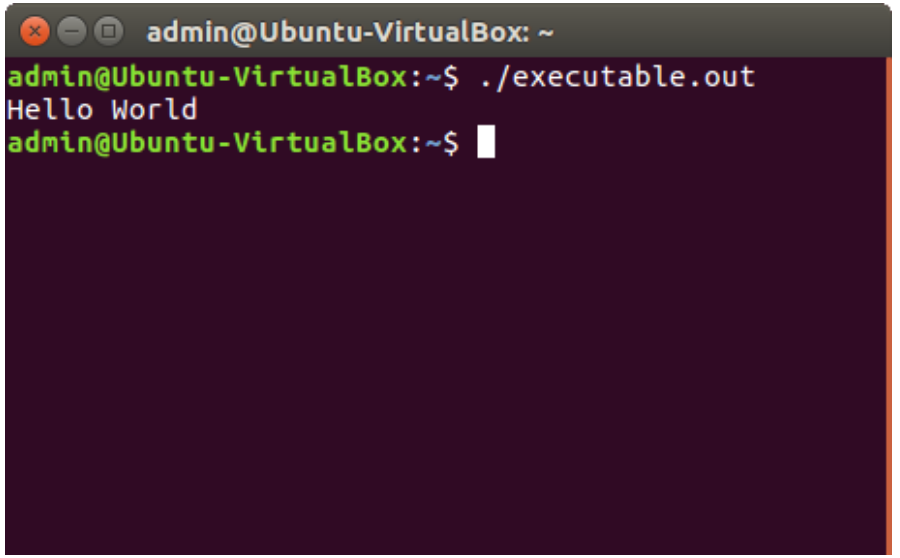
https://www.slashgear.com/researchers-create-first-ever-human-to-human-interface-use-it-to-play-a-game-27295122/

Desktop PC vs. Micro PC

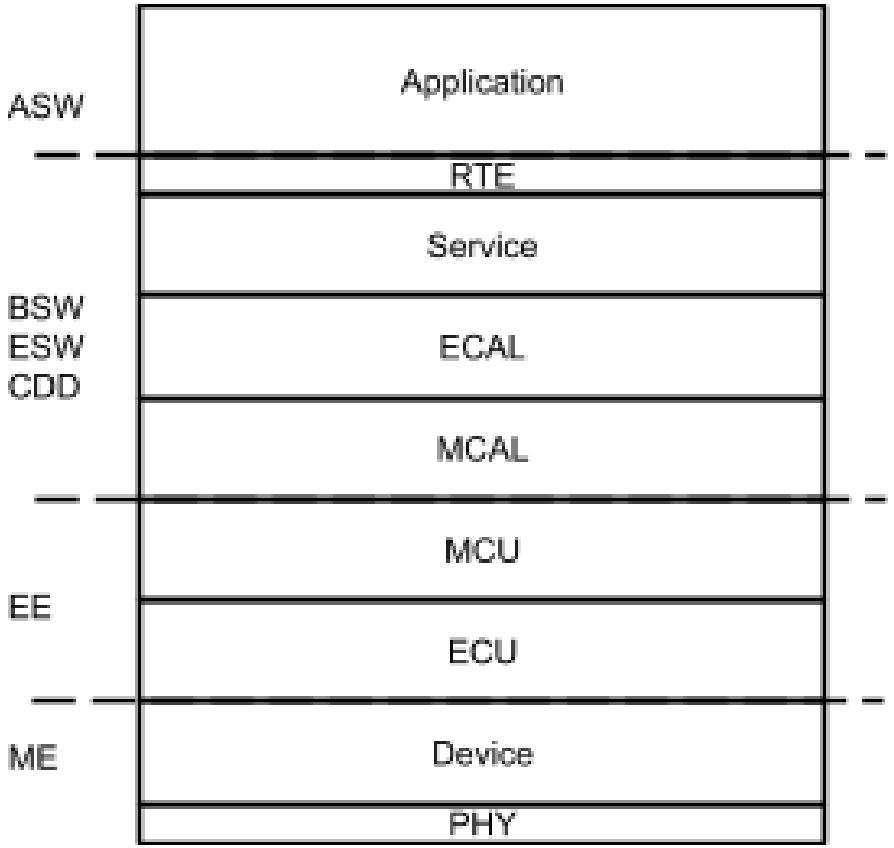


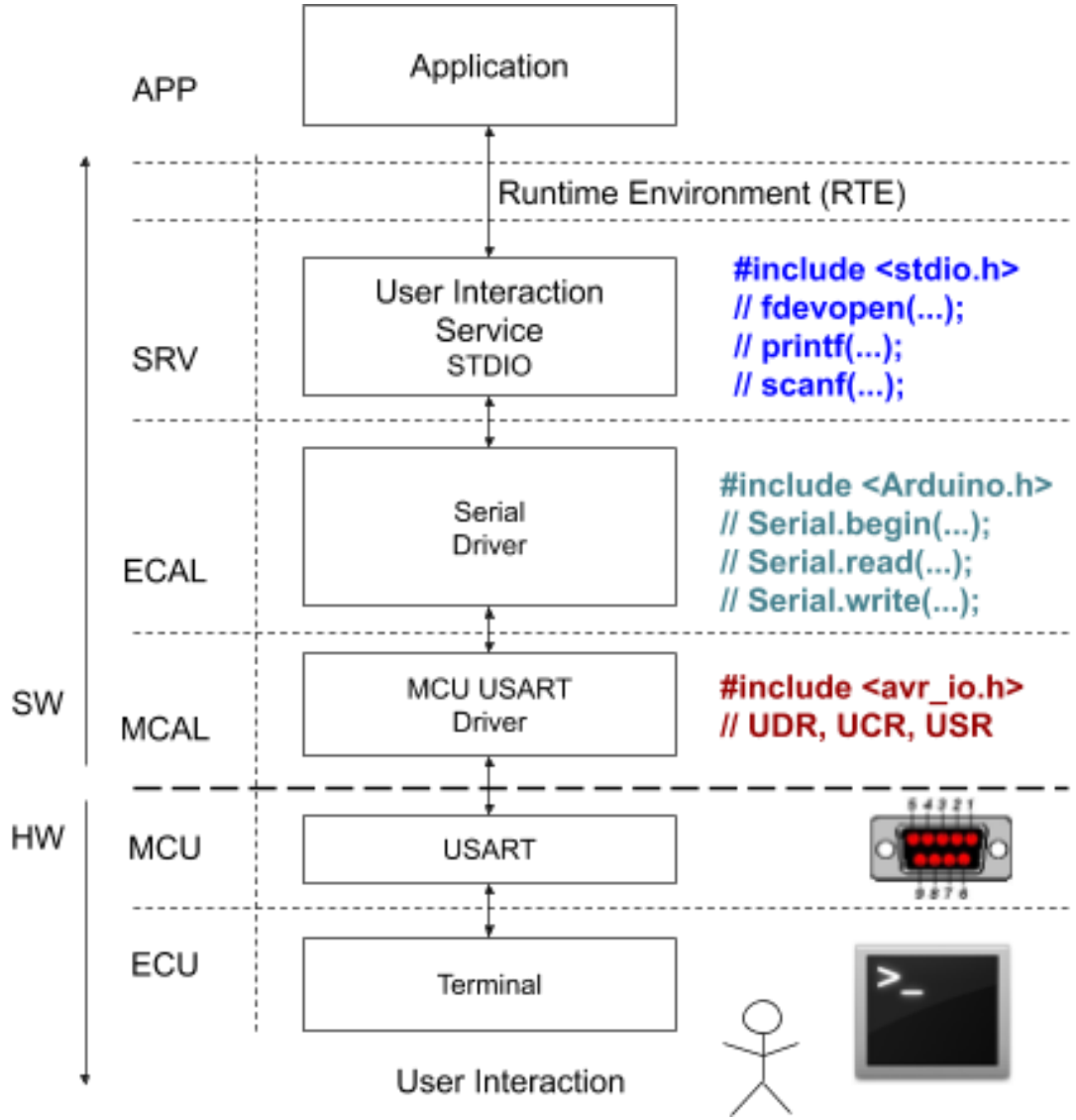
Стандартный интерфейс ввода/вывода - STDIO





Serial Terminal User interaction





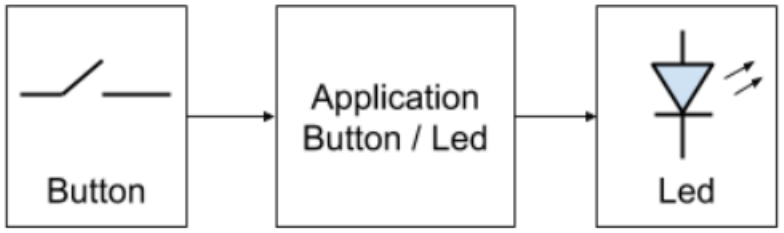
Подключение STDIO к MCU– Serial / UART

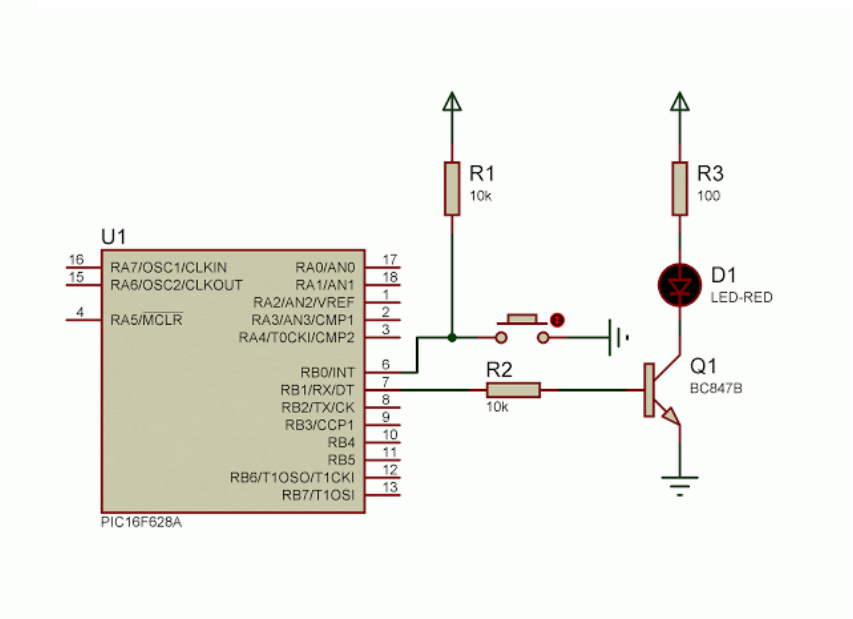
https://www.nongnu.org/avr-libc/user-manual/group__avr__stdio.html

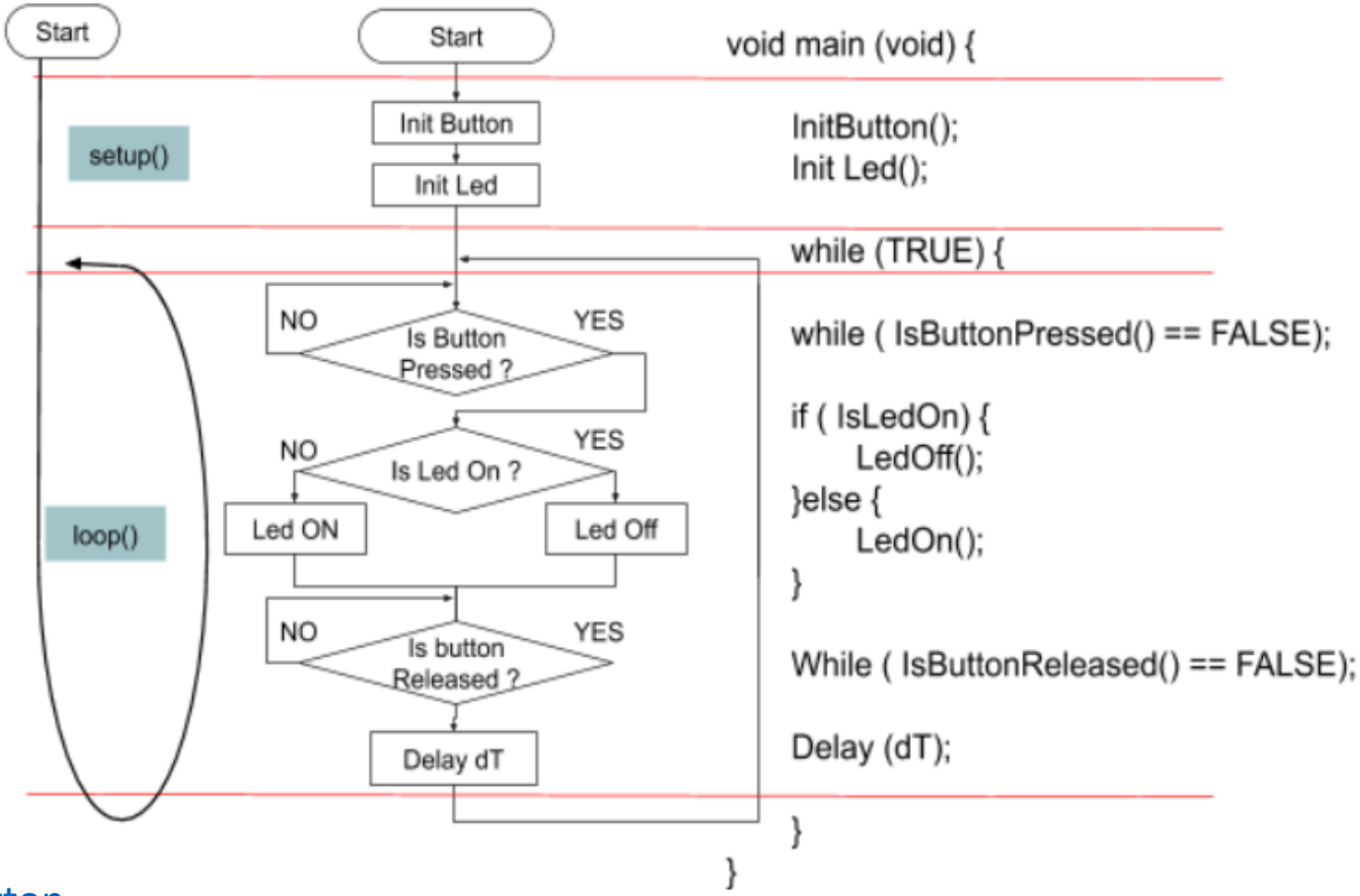
```
// 1. Includere Libraria STDIO
#include <stdio.h>
#include <Arduino.h>

// 2. Definire funcție scriere caracter
void my_putChar( char ch, FILE * f){
      return Serial.write( c );
}
// 3. Definire funcție citire caracter
char my_GetChar(FILE * f){
      while(!Serial.available());
      return Serial.read();
}
```

```
void main(void){
      // 4. inițializare periferii
      Serial.begin(9600)

      // 5. Definire stream
      FILE *my_stream = fdevopen(my_putChar,
      my_GetChar);

      // 6. înlocuire intrarea /ieșirea standard
      // (optional pentru prima initializare)
        stdin = stdout = my_stream ;

      // 7. Utilizare STDIO
        printf("Hello World")
}
```

Бинарные интерфейсы– Buton / LED







https://arduinogetstarted.com/tutorials/arduino-button

https://arduinogetstarted.com/tutorials/arduino-led-blink

https://arduinogetstarted.com/tutorials/arduino-button-led

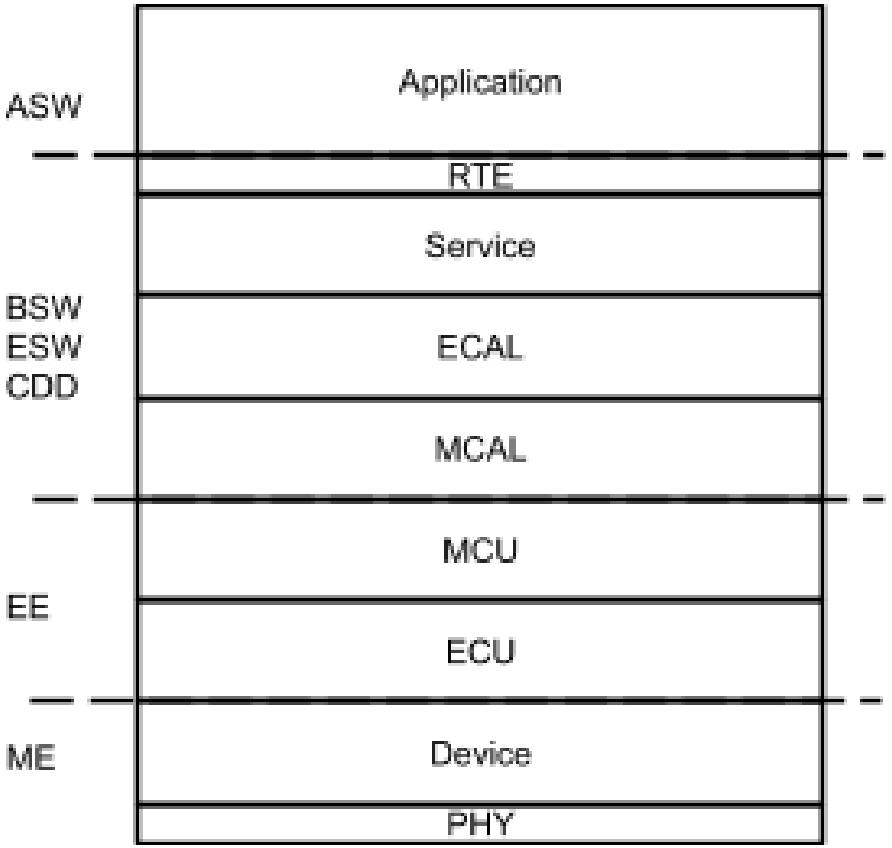
Подключение STDIO к MCU– Button/LED

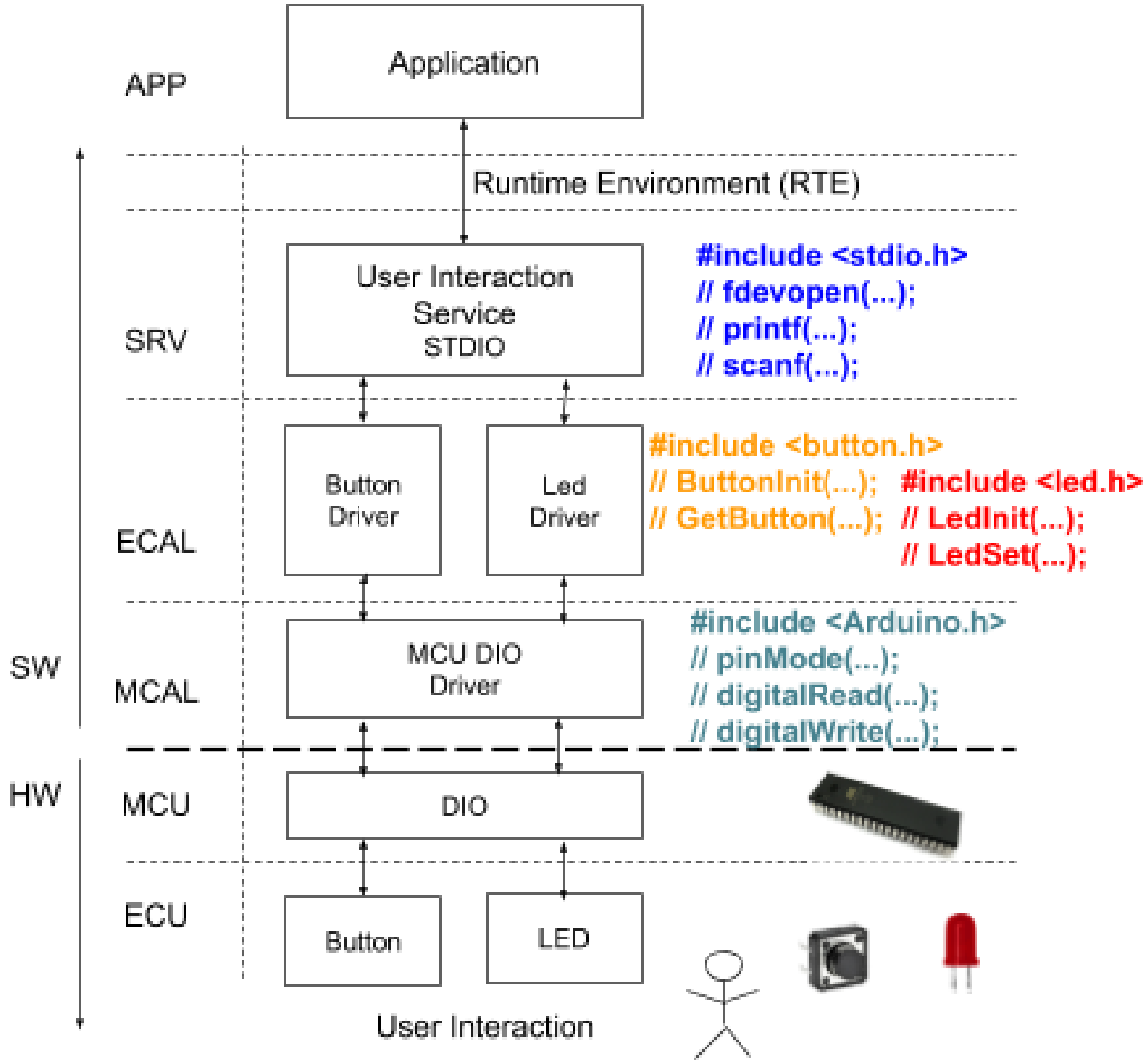
https://www.nongnu.org/avr-libc/user-manual/group__avr__stdio.html

```
// 1. Includere Libraria STDIO
#include <stdio.h>
#include “led.h”
#include “button.h”
// 2. Definire funcție setare LED
void SetLed( char ch, FILE * f){
        If(ch == ‘1’) LedOn();
        else  if (ch == ‘0’) LedOff();
}
// 3. Definire funcție citire Buton
char GetButton(FILE * f){
        while ( IsButtonPressed() == FALSE);
        return ‘1’
}
```

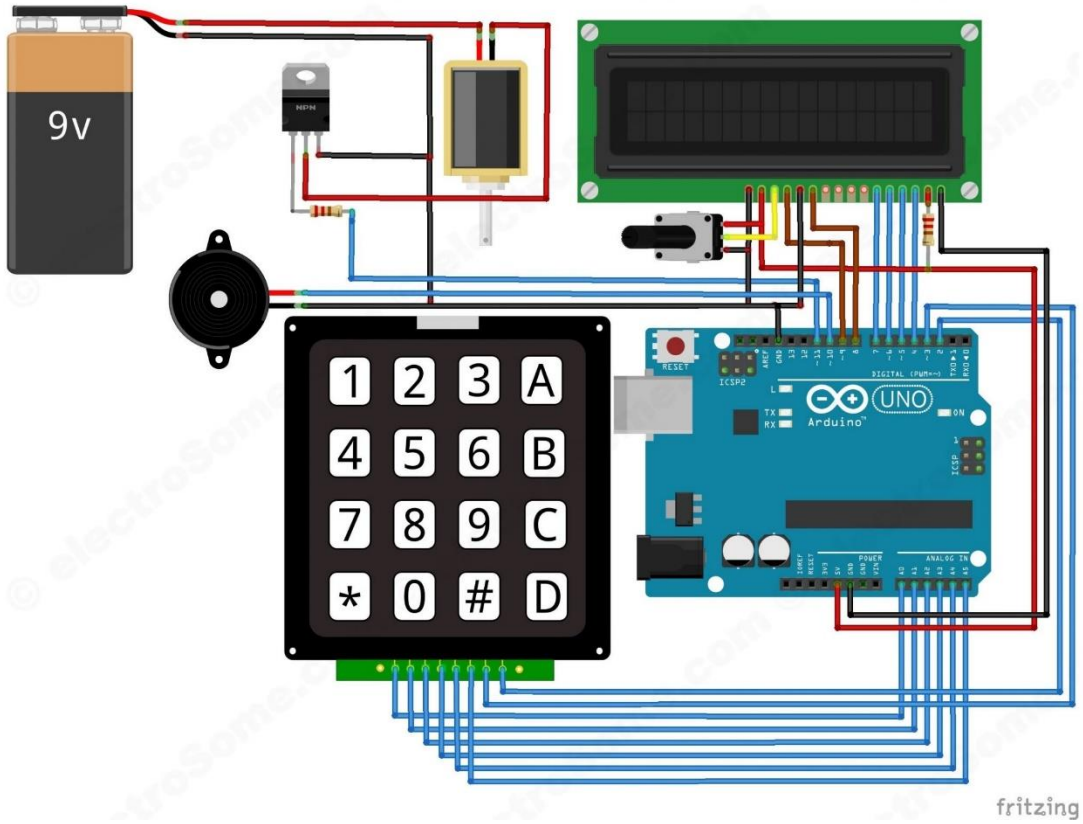
```
void main(void){
        // 4. inițializare periferii
        ButtonInit();
        LedInit();

        // 5. Definire stream
        FILE *my_stream = fdevopen(SetLed, GetButton);

        // 6. înlocuire intrarea /ieșirea standard
        // (optional pentru prima initializare)
          stdin = stdout = my_stream ;

        // 7. Utilizare STDIO
        scanf(“%d”, button_state)
        If (button_state == ‘1’)    LedToggle()
}
```

Button Led User interaction





Keypad LCD User Interaction




```
#include <LiquidCrystal.h>
//#include <LiquidCrystal_I2C.h>
LiquidCrystal lcd(...);
lcd.init();
lcd.print("Hello World !");
```

```
#include <Keypad.h>
Keypad keypad = Keypad(...);
char key = keypad.getKey();
```

https://arduinogetstarted.com/tutorials/arduino-keypad

https://arduinogetstarted.com/tutorials/arduino-lcd

https://arduinogetstarted.com/tutorials/arduino-keypad-lcd

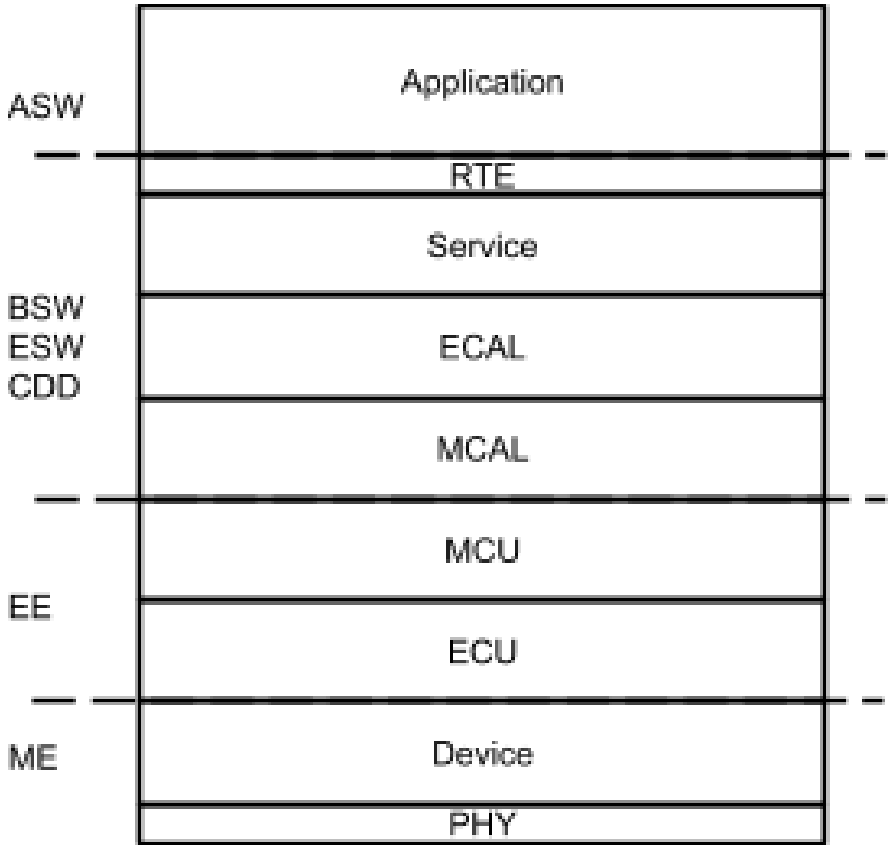
Подключение STDIO к MCU– KeyPad/Lcd

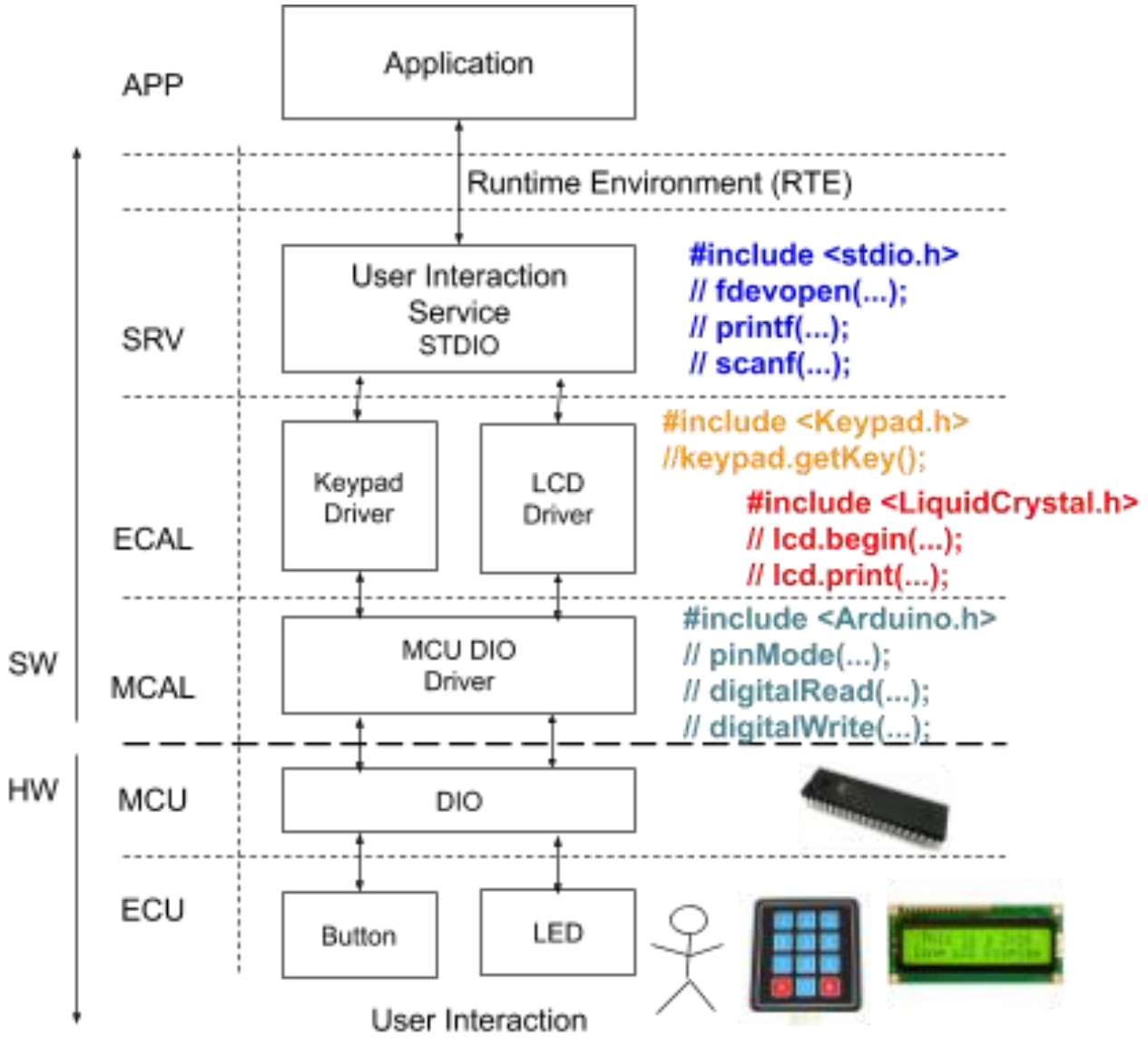
https://www.nongnu.org/avr-libc/user-manual/group__avr__stdio.html

```
// 1. Includere Libraria STDIO
#include <stdio.h>
#include <Keypad.h>
#include <LiquidCrystal.h>
// 2. Definire funcție setare LED
void LcdPutChar( char ch, FILE * f){
        lcd.print(ch);
}
// 3. Definire funcție citire Buton
char KeypadGetChar(FILE * f){
        char key;
        do{ key = keypad.getKey();
        }while ( key == 0);
        return key
}
```

```
void main(void){
        // 4. inițializare periferii
        lcd.begin(16, 2);

        // 5. Definire stream
        FILE *my_stream = fdevopen(LcdPutChar, KeypadGetChar);

        // 6. înlocuire intrarea /ieșirea standard
        // (opțional pentru prima inițializare)
          stdin = stdout = my_stream ;

        // 7. Utilizare STDIO
        scanf("%s", msg);
        printf("%s",msg);
}
```

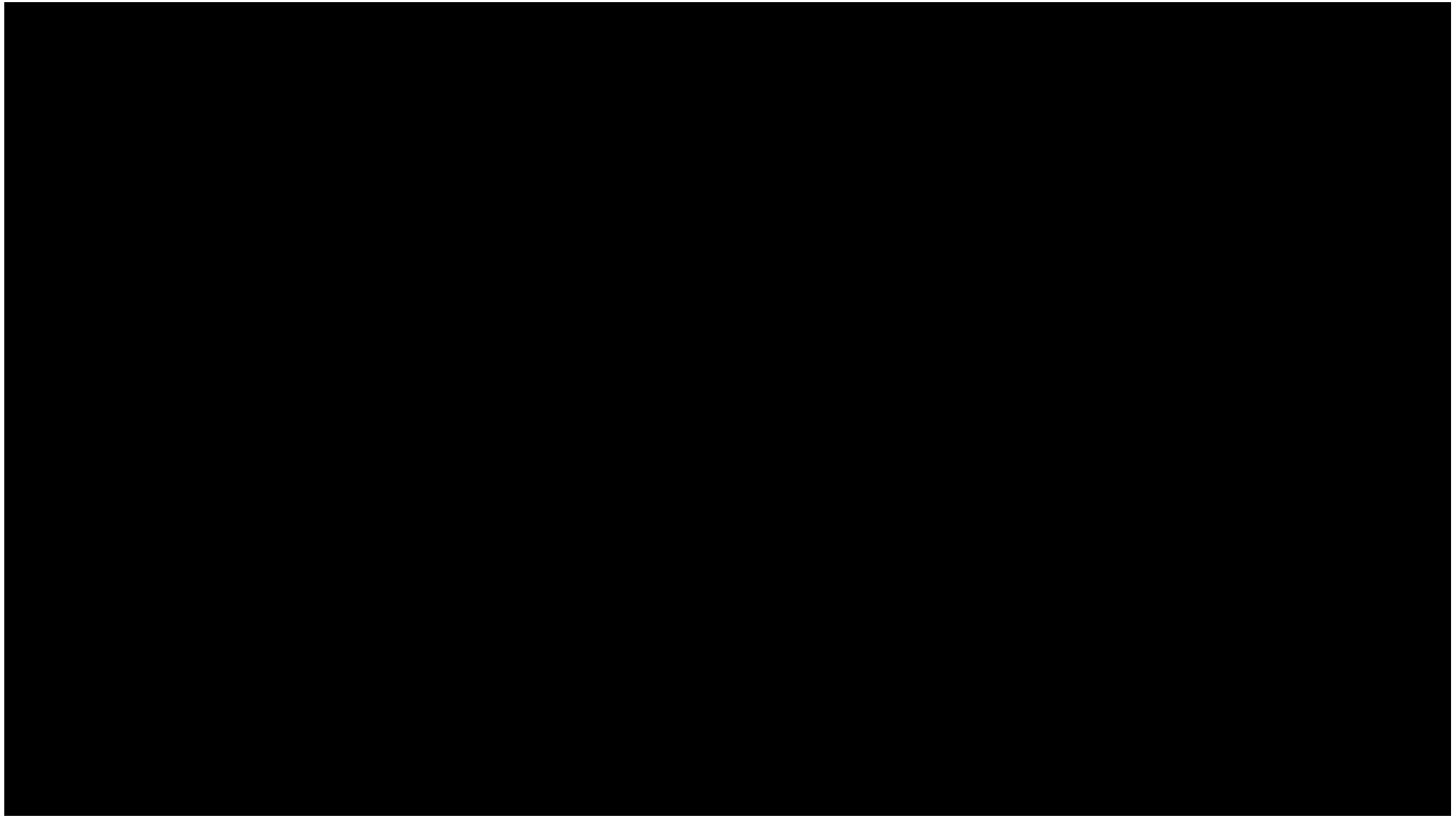
Button Led User interaction





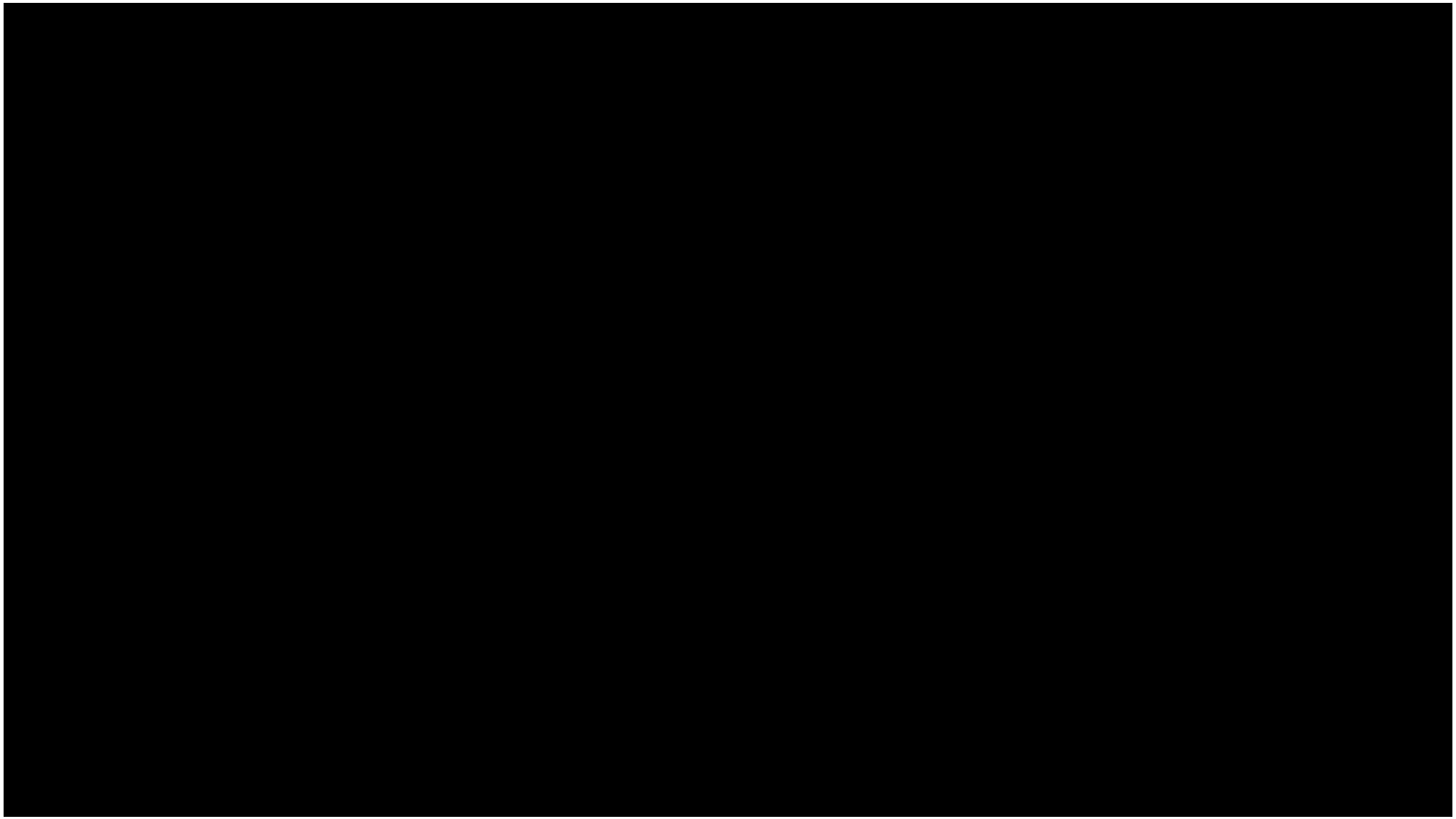
Тактильные взаимодействия

https://youtu.be/ZSFpxVc0Gm8



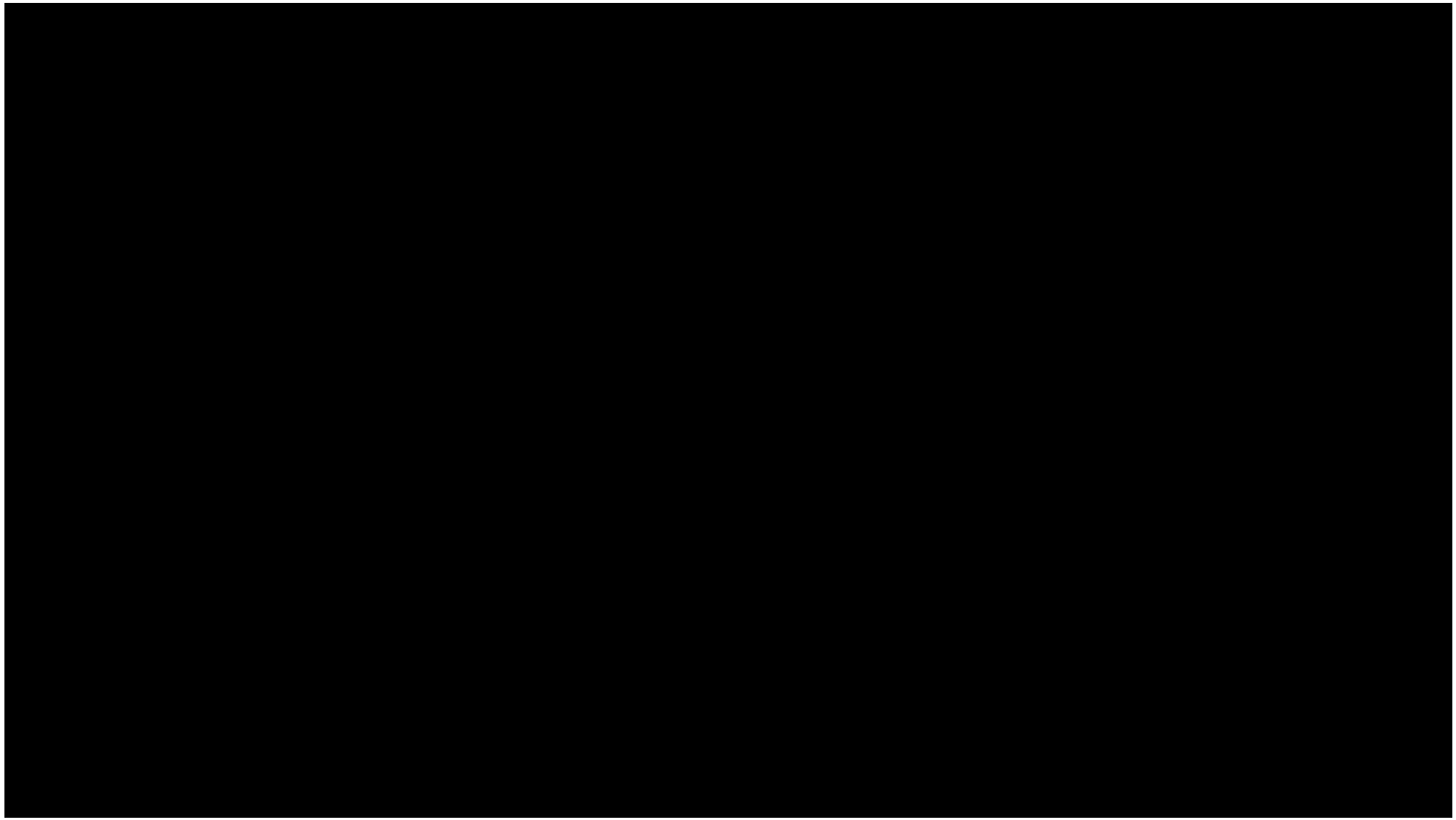
Звуковые взаимодействия

https://youtu.be/6-1bvYNqw0A



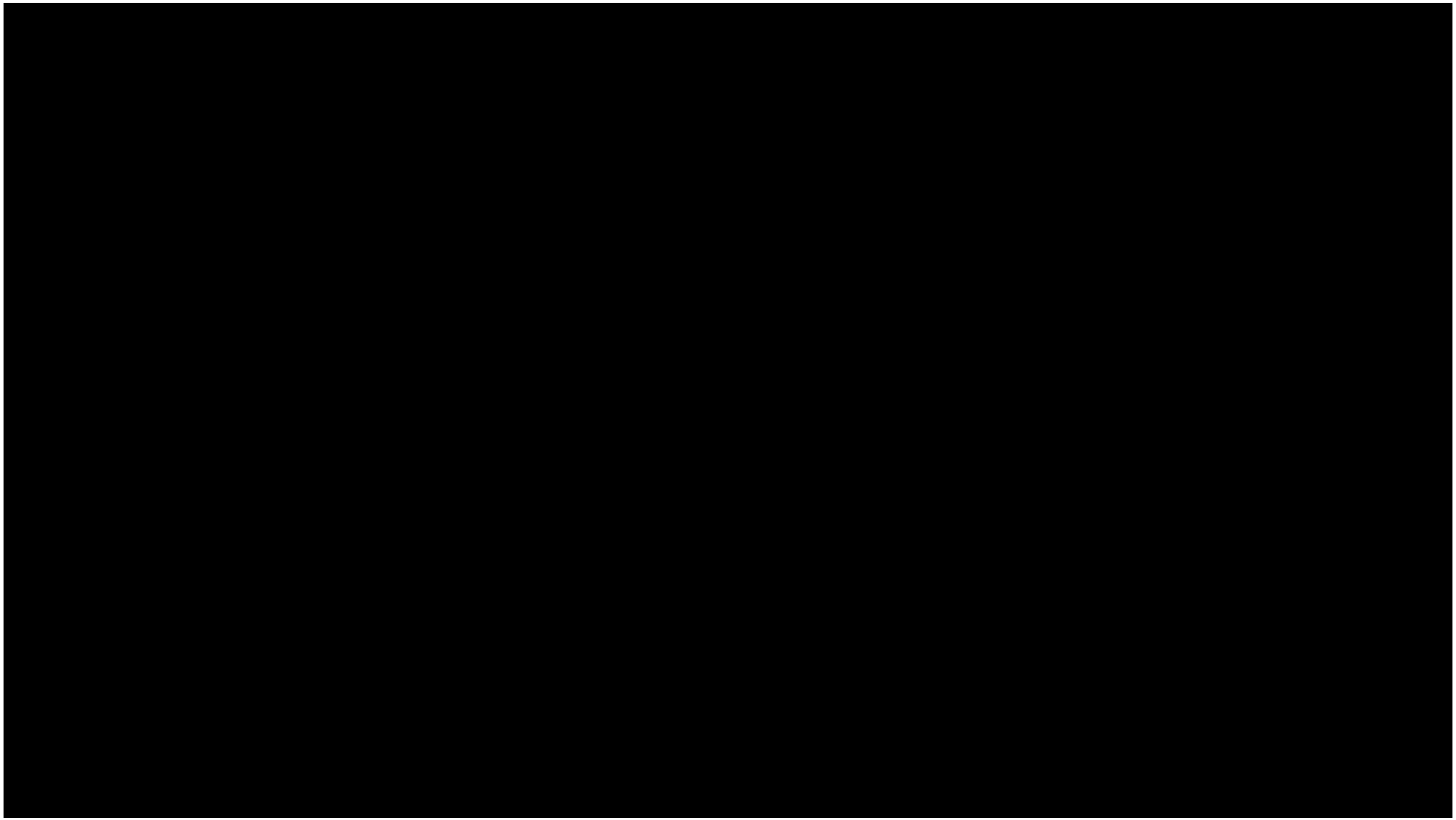
https://youtu.be/f9MwaH6oGEY

Виртуальная реальность vs Дополненная реальность



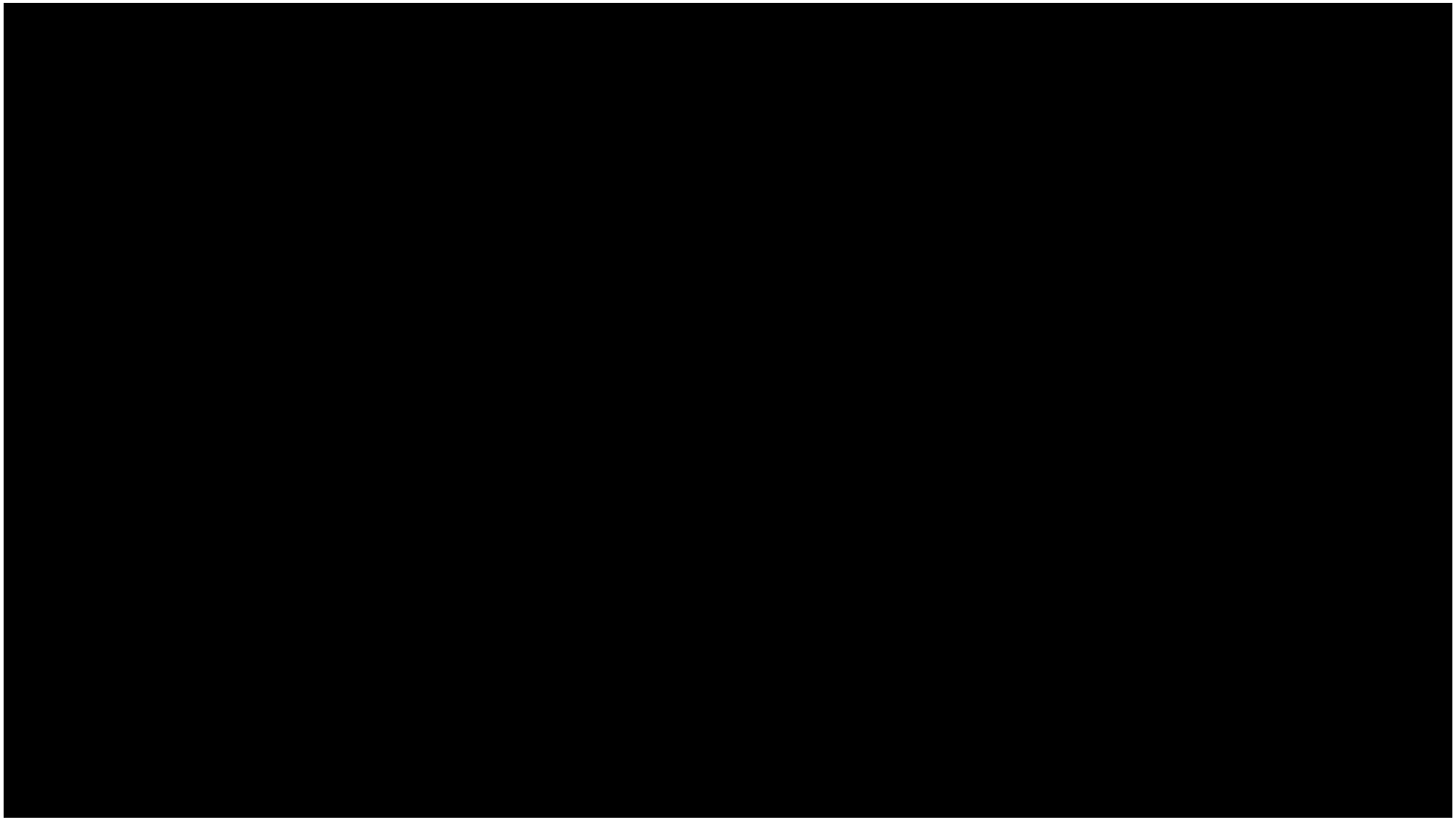
https://youtu.be/73yDRm8KaWY

Визуальные взаимодействия Wii



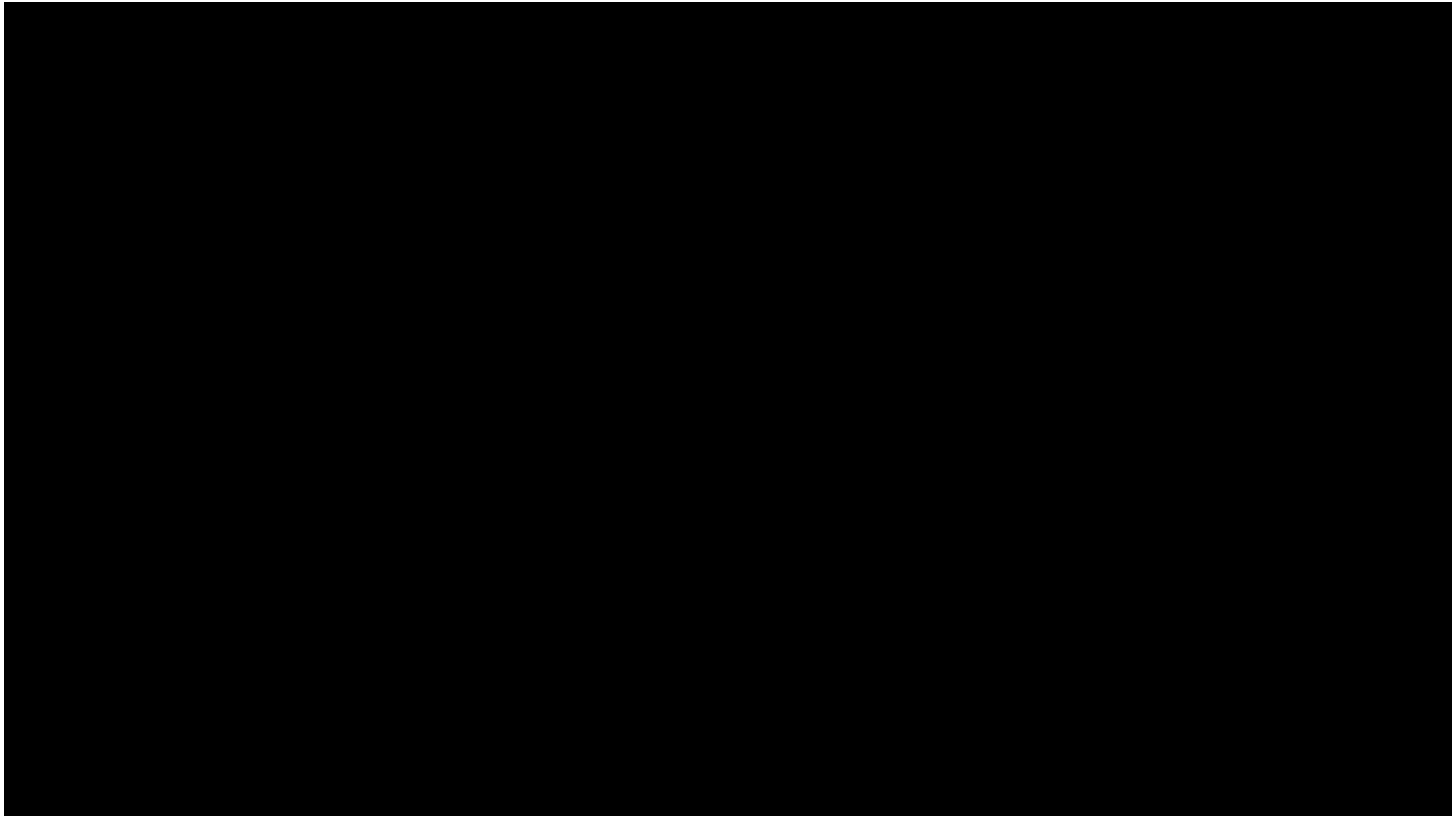
https://youtu.be/Ql2bUcLH0Pc

Визуальные взаимодействия — Kinect



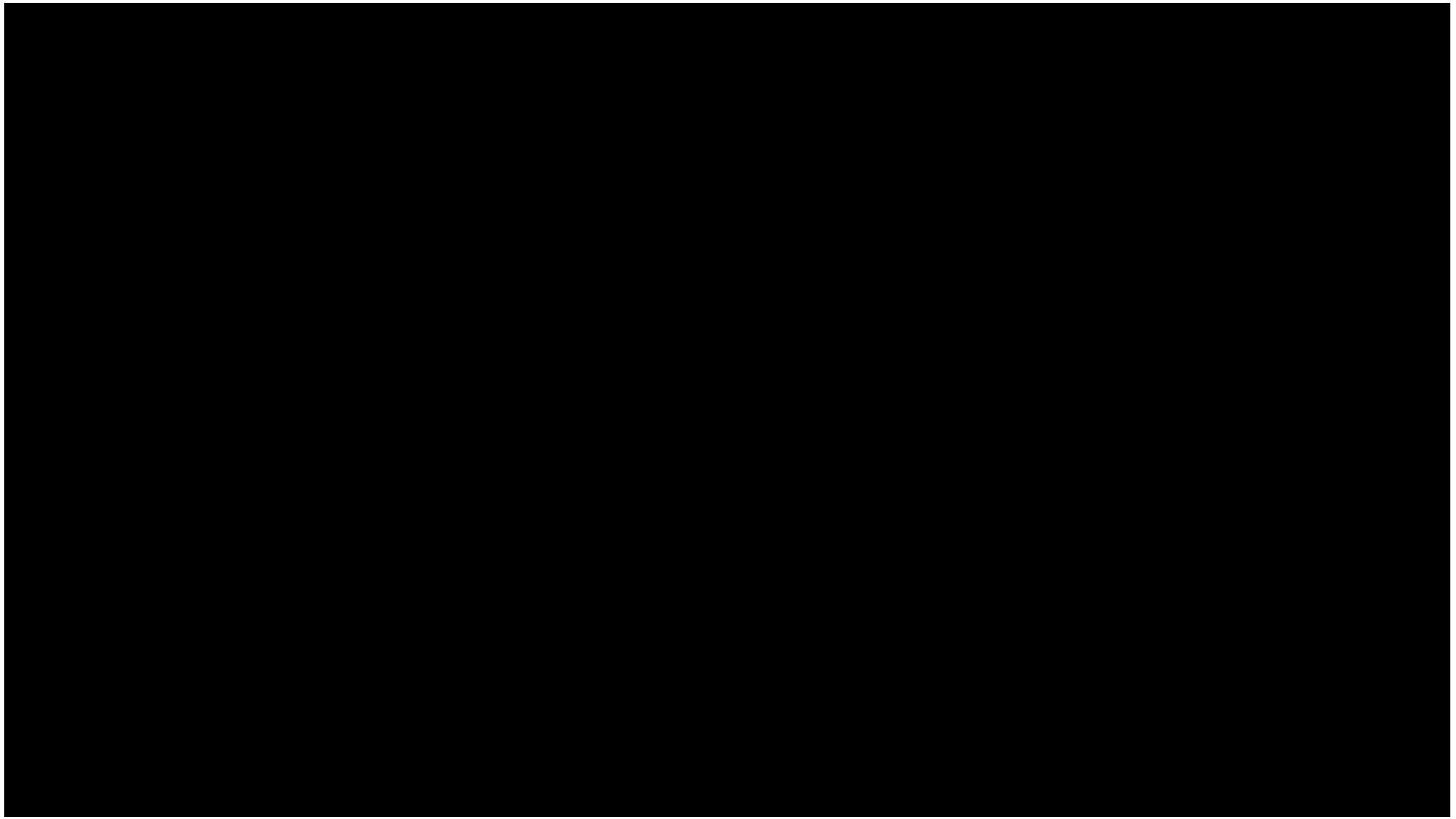
Bionic Arm

https://youtu.be/F_brnKz_2tI



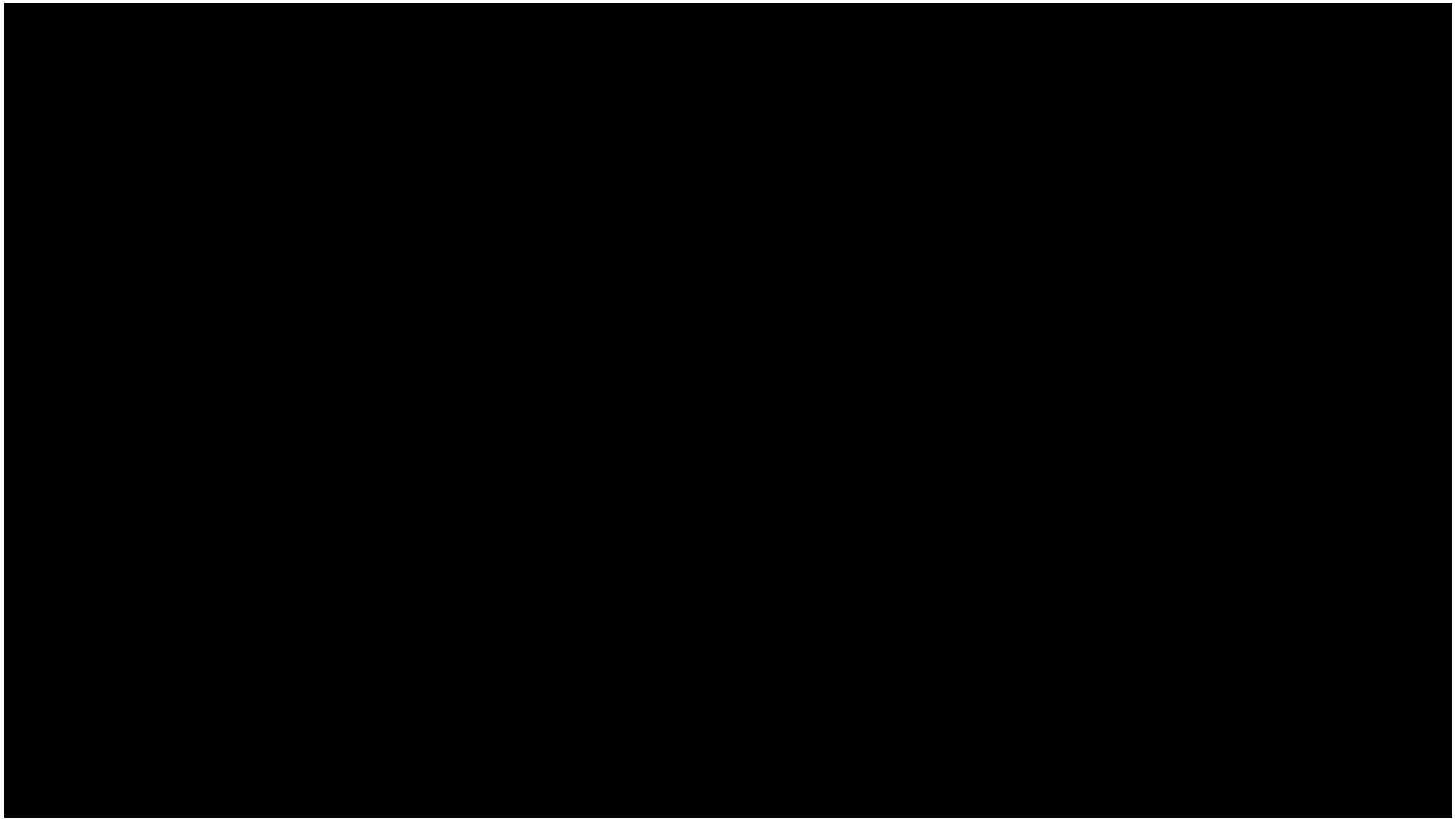
https://youtu.be/rSQNi5sAwuc

Mind interaction experiment TEDx



https://youtu.be/dn7l9q9RF5M

Human – Human Interface Gamer



https://youtu.be/oIAlGXpB3Fw

Human – Human Interface Movie- Nerve