

# Smart dancing suit

J. Lehmann, M. Benninger, T. Becker, B. Gashi and K. Buraj

Albert-Ludwigs-Universität Freiburg

UNI  
FREIBURG

## Making music visible

- The sound of the environment is measured by a microphone
- LEDs react to the environment sound
- Intelligent music recognition by applying Fourier transform to the sound measurements
- Display of the music spectrum on the chest

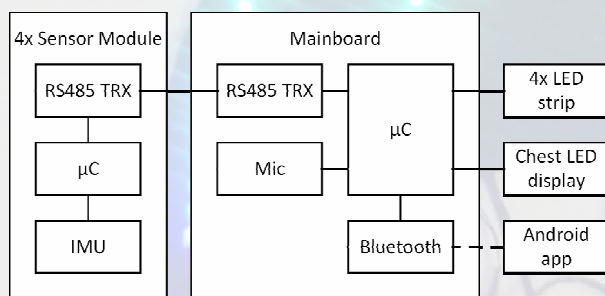
## Reacting to movements

- Body movements are detected by IMUs mounted on hands and feet
- LEDs react to the movements measured by the IMUs

## Creating an audiovisual performance

- LEDs change their colors and blinking patterns according to the music and the movements of the wearer
- Suit behavior can be configured via android app
- Sensor measurements allow generating an LED light show on the fly
- Adapting the light show to the dancing moves and music instead of dancing a predefined choreography is what makes the suit "smart"

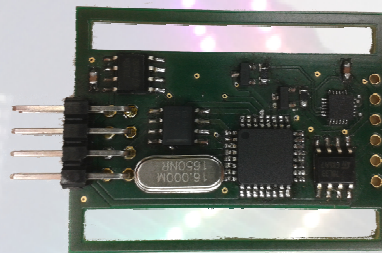
## Hardware architecture



Schematic setup of the system

- STM32F411E discovery board with breadboard shield as mainboard
- Individually addressable WS2812 RGB LEDs on arms, legs and the chest
- 10 x 10 LED display on the chest
- Sound detection with Adafruit MAX9814 microphone module
- Communication with an android app via DFRobot serial Bluetooth module
- Bluetooth module uses UART interface to communicate with the microcontroller
- Sensor modules on hands and feet for motion detection

## Sensor module

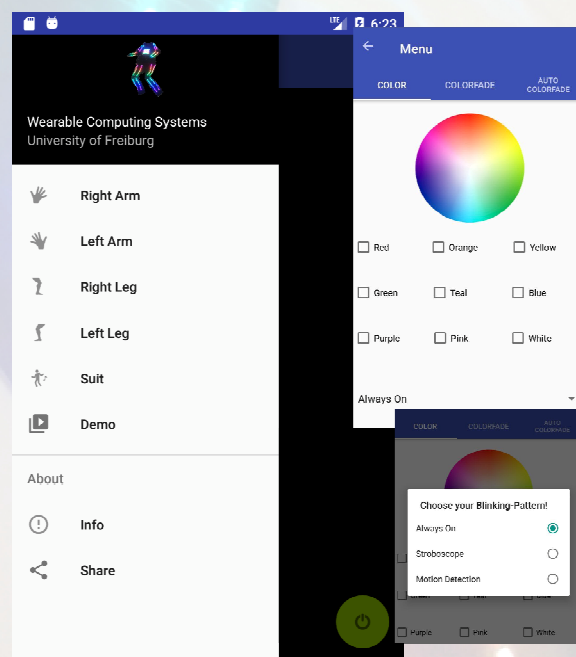


Sensor board

- Arduino compatible custom sensor board hardware
- The IMUs on each sensor board perform 6-axis sensor fusion
- Yaw, pitch, roll and 3-axis acceleration data of each sensor board is send to the mainboard over an RS485 based master-slave bus

## Android app

- User can select features for body parts
  - Colors of the LED
  - Colors for the color fade function
  - Display music spectrum
- Choose the blinking pattern of the suit
  - Always on
  - Stroboscope
  - Motion detection



Design of the app menus