Braille Glove

Generated by Doxygen 1.13.2

Chapter 1

Hierarchical Index

1.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 2

Class Index

2.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 3

File Index

3.1 File List

Here is a list of all documented files with brief descriptions:

Chapter 4

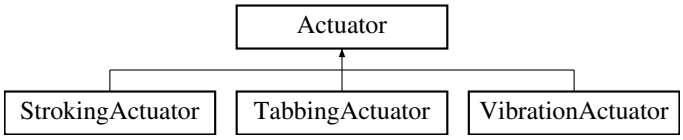
Class Documentation

4.1 Actuator Class Reference

Abstract class for implementing different types of actuators.

`#include <Actuator.h>`

Inheritance diagram for Actuator:



Public Member Functions

- Actuator (int pin, ActuatorType type)

  Constructor for the Actuator class.
- virtual void activate ()=0

  Pure virtual function to activate the actuator.
- virtual void deactivate ()=0

  Pure virtual function to deactivate the actuator.

Protected Attributes

- int **pin**

  GPIO pin number the actuator is connected to.
- ActuatorType **actuatorType**

  Type of actuator (e.g., vibration, stroking, tabbing).
- bool **turnedOn** = false

  Flag to check if the actuator is currently active.

4.1.1 Detailed Description

Abstract class for implementing different types of actuators.

This class provides a base for all actuator types, defining common properties and methods.

4.1.2 Constructor & Destructor Documentation

4.1.2.1 Actuator()

```
Actuator::Actuator (
            int pin,
            ActuatorType type)  [inline]
```

Constructor for the Actuator class.

Parameters

pin	The GPIO pin to which the actuator is connected.
type	The type of actuator.

4.1.3 Member Function Documentation

4.1.3.1 activate()

```
virtual void Actuator::activate ()  [pure virtual]
```

Pure virtual function to activate the actuator.

This function must be implemented by derived classes to define how the actuator should be activated.

Implemented in StrokingActuator, TabbingActuator, and VibrationActuator.

4.1.3.2 deactivate()

```
virtual void Actuator::deactivate ()  [pure virtual]
```

Pure virtual function to deactivate the actuator.

This function must be implemented by derived classes to define how the actuator should be deactivated.

Implemented in StrokingActuator, TabbingActuator, and VibrationActuator.

The documentation for this class was generated from the following file:

- src/ActuatorTypes/Actuator.h

4.2 ActuatorProcessingOrderMapper Class Reference

Reorders braille dot numbers based on finger sensitivity order.

`#include <ActuatorProcessingOrderMapper.h>`

Public Member Functions

- ActuatorProcessingOrderMapper ()
  Constructor for ActuatorProcessingOrderMapper.
- std::vector< int > reorderVectorBySensitivity (const std::vector< int > &values)
  Reorders a vector of braille chords based on sensitivity.

4.2.1 Detailed Description

Reorders braille dot numbers based on finger sensitivity order.

This class processes braille chords and reorders the actuation sequence based on predefined sensitivity levels of each dot.

4.2.2 Constructor & Destructor Documentation

4.2.2.1 ActuatorProcessingOrderMapper()

```
ActuatorProcessingOrderMapper::ActuatorProcessingOrderMapper ()
```

Constructor for ActuatorProcessingOrderMapper.

Initializes the sensitivity order mapping.

4.2.3 Member Function Documentation

4.2.3.1 reorderVectorBySensitivity()

```
std::vector< int > ActuatorProcessingOrderMapper::reorderVectorBySensitivity (
            const std::vector< int > & values)
```

Reorders a vector of braille chords based on sensitivity.

Each braille chord in the vector is restructured based on the predefined sensitivity order.

Parameters

values	A vector of braille chords encoded as integers.

Returns

A reordered vector with braille chords sorted by sensitivity.

The documentation for this class was generated from the following files:

- src/Mapper/ActuatorProcessingOrderMapper.h
- src/Mapper/ActuatorProcessingOrderMapper.cpp

4.3 BrailleMapper Class Reference

Maps characters to their corresponding Braille integer representations.

`#include <BrailleMapper.h>`

Public Member Functions

- **BrailleMapper** ()

  Constructs a BrailleMapper object and initializes mappings.
- int getBrailleHash (char letter) const

  Retrieves the Braille integer representation of a given letter.
- std::vector< int > stringToIntegerList (const String &input) const

  Converts a string into a list of Braille integer representations.

4.3.1 Detailed Description

Maps characters to their corresponding Braille integer representations.

This class provides functionality to convert individual characters and strings into Braille numerical representations based on English Tier One Braille.

4.3.2 Member Function Documentation

4.3.2.1 getBrailleHash()

```
int BrailleMapper::getBrailleHash (
            char letter) const
```

Retrieves the Braille integer representation of a given letter.

Parameters

letter	The character to be mapped.

Returns

The corresponding Braille integer representation.

4.3.2.2 stringToIntegerList()

```
std::vector< int > BrailleMapper::stringToIntegerList (
            const String & input) const
```

Converts a string into a list of Braille integer representations.

Given an input string (e.g., "hello"), this function returns a vector containing the corresponding Braille integer values for each character.

Parameters

input	The input string to convert.

Returns

A vector of integers representing the Braille values of the characters.

The documentation for this class was generated from the following files:

- src/Mapper/BrailleMapper.h
- src/Mapper/BrailleMapper.cpp

4.4 Controller Class Reference

Handles the initialization and execution of either the master or slave mode.

```
#include <Controller.h>
```

Public Member Functions

- Controller (bool isSlave)
  Constructor for the Controller class.
- void setup ()
  Sets up the master or slave mode based on the given conditions.
- void loop ()
  Runs the main execution loop for either the master or slave mode.

4.4.1 Detailed Description

Handles the initialization and execution of either the master or slave mode.

This class determines whether the system should operate as a master or a slave and initializes the appropriate class accordingly.

4.4.2 Constructor & Destructor Documentation

4.4.2.1 Controller()

```
Controller::Controller (
            bool isSlave)
```

Constructor for the Controller class.

Determines whether the device should act as a master or a slave.

Parameters

isSlave	A boolean flag indicating whether the device should run in slave mode.

4.4.3 Member Function Documentation

4.4.3.1 loop()

```
void Controller::loop ()
```

Runs the main execution loop for either the master or slave mode.

This function should be called continuously in the main program loop.

4.4.3.2 setup()

```
void Controller::setup ()
```

Sets up the master or slave mode based on the given conditions.

This function initializes the appropriate components depending on whether the device is in master or slave mode.

The documentation for this class was generated from the following files:

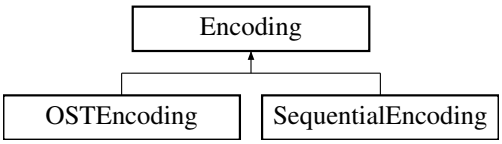
- src/Controller/Controller.h
- src/Controller/Controller.cpp

4.5 Encoding Class Reference

Base class for encoding operations.

```
#include <Encoding.h>
```

Inheritance diagram for Encoding:



Static Public Member Functions

- static void customDelay (unsigned long timeInMs)

  Custom delay function to provide a non-blocking delay.
- static bool validIndex (int number, Hand hand)

  Checks whether the given pin number is valid for the specified hand.

4.5.1 Detailed Description

Base class for encoding operations.

This class provides the basic functions for encoding used by its child classes.

4.5.2 Member Function Documentation

4.5.2.1 customDelay()

```
static void Encoding::customDelay (
            unsigned long timeInMs)  [inline], [static]
```

Custom delay function to provide a non-blocking delay.

This function allows for a non-blocking delay (unlike the blocking `delay()` function in Arduino), so the program can continue execution while waiting.

Parameters

timeInMs	The delay duration in milliseconds.

< Get the current time

< The program continues executing other tasks

4.5.2.2 validIndex()

```
static bool Encoding::validIndex (
            int number,
            Hand hand)  [inline], [static]
```

Checks whether the given pin number is valid for the specified hand.

This function validates whether the pin number belongs to the correct hand (left or right) based on the actuator configuration.

Parameters

number	The pin number to be validated.
hand	The hand (left or right) for which the validation is being done.

Returns

True if the pin is valid for the hand; false otherwise.

The documentation for this class was generated from the following file:

- src/Models/EncodingScheme/Encoding.h

4.6 GloveModel Class Reference

Public Member Functions

- **GloveModel** (Hand hand, Actuator &actuator1, Actuator &actuator2, Actuator &actuator3)
- void **resetAllActuators** ()
- void **executePatternAt** (int index)
- void **pauseBetweenLetters** ()
- void **vibrateOnNumber** (int number)
- void **setPattern** (std::vector< int > newValues)
- std::vector< int > **getPattern** ()
- int **getPatternLength** ()
- void **setChordMode** (ChordingScheme chordMode)

The documentation for this class was generated from the following file:

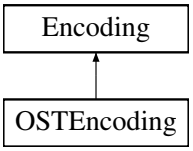
- src/Models/GloveModel.h

4.7 OSTEncoding Class Reference

Handles the OST encoding scheme for actuators.

`#include <OSTEncoding.h>`

Inheritance diagram for OSTEncoding:



Static Public Member Functions

- static void handle (int number, Actuator **actuators, Hand hand)

  Activates an actuator based on the OST encoding sequence.

Static Public Member Functions inherited from Encoding

- static void customDelay (unsigned long timeInMs)

  Custom delay function to provide a non-blocking delay.
- static bool validIndex (int number, Hand hand)

  Checks whether the given pin number is valid for the specified hand.

4.7.1 Detailed Description

Handles the OST encoding scheme for actuators.

This class defines the OST encoding scheme and how the actuators should be activated based on that scheme.

4.7.2 Member Function Documentation

4.7.2.1 handle()

```
static void OSTEncoding::handle (
            int number,
            Actuator ** actuators,
            Hand hand)  [inline], [static]
```

Activates an actuator based on the OST encoding sequence.

This function handles the activation of actuators based on the OST encoding scheme. The activation sequence is determined by the index number and the hand (left or right). The appropriate actuator is activated according to the given index, and a custom delay is applied.

Parameters

number	The index number representing the actuator to be activated.
actuators	The array of actuator pointers to be used.
hand	The hand (left or right) to which the actuator belongs.

The documentation for this class was generated from the following file:

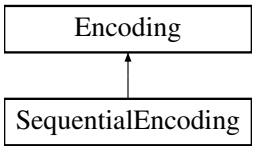
- src/Models/EncodingScheme/OSTEncoding.h

4.8 SequentialEncoding Class Reference

Handles the sequential encoding scheme for actuators.

`#include <SequentialEncoding.h>`

Inheritance diagram for SequentialEncoding:



Static Public Member Functions

- static void handle (int number, Actuator **actuators, Hand hand)

  Activates and deactivates an actuator based on the sequential encoding scheme.

Static Public Member Functions inherited from Encoding

- static void customDelay (unsigned long timeInMs)

  Custom delay function to provide a non-blocking delay.
- static bool validIndex (int number, Hand hand)

  Checks whether the given pin number is valid for the specified hand.

4.8.1 Detailed Description

Handles the sequential encoding scheme for actuators.

This class defines the sequential encoding scheme and how the actuators should be activated in sequence.

4.8.2 Member Function Documentation

4.8.2.1 handle()

```
static void SequentialEncoding::handle (
            int number,
            Actuator ** actuators,
            Hand hand)  [inline], [static]
```

Activates and deactivates an actuator based on the sequential encoding scheme.

This function handles the sequential encoding scheme by activating the actuator corresponding to the given pin number and hand (left or right). After activation, the actuator is deactivated after a specified duration. A delay is applied both after activation and deactivation.

Parameters

number	The index number representing the actuator to be activated.
actuators	The array of actuator pointers to be used.
hand	The hand (left or right) to which the actuator belongs.

The documentation for this class was generated from the following file:

- src/Models/EncodingScheme/SequentialEncoding.h

4.9 SingeltonGloveSettings Class Reference

Static Public Member Functions

- static SingeltonGloveSettings & **getInstance** ()

Public Attributes

- const int **OST_OFFSET** = 10
- const int **DURATION** = 200
- const int **PAUSE** = 2000
- const int **NUM_ACTUATORS** = 3
- const int **AUDIO_VIBRATION_OFFSET** = 100
- const int **SEQ_OFFSET** = 1000
- const int **studyOstRepititions** = 126
- const int **studySeqRepititions** = 44

The documentation for this class was generated from the following file:

- src/Settings/SingeltonGloveSettings.h

4.10 SingeltonWifiConnector Class Reference

Static Public Member Functions

- static SingeltonWifiConnector & **getInstance** ()

Public Attributes

- const char * **MASTER_SSID** = "MV-Glove"
- const char * **SLAVE_SSID** = "VS-Glove"
- const uint8_t **SLAVE_MAC** [6] = {0x48, 0x55, 0x19, 0xF6, 0xC9, 0xB3}

The documentation for this class was generated from the following file:

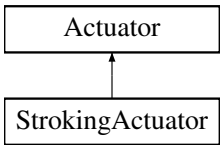
- src/Settings/SingeltonWifiSettings.h

4.11 StrokingActuator Class Reference

A class representing a stroking actuator.

`#include <StrokingActuator.h>`

Inheritance diagram for StrokingActuator:



Public Member Functions

- StrokingActuator (int pin)

  Constructor for StrokingActuator.
- void activate () override

  Activates the stroking actuator.
- void deactivate () override

  Deactivates the stroking actuator.

Public Member Functions inherited from Actuator

- Actuator (int pin, ActuatorType type)

  Constructor for the Actuator class.

Additional Inherited Members

Protected Attributes inherited from Actuator

- int **pin**

  GPIO pin number the actuator is connected to.
- ActuatorType **actuatorType**

  Type of actuator (e.g., vibration, stroking, tabbing).
- bool **turnedOn** = false

  Flag to check if the actuator is currently active.

4.11.1 Detailed Description

A class representing a stroking actuator.

This actuator is designed to create a stroking sensation using a servo motor.

4.11.2 Constructor & Destructor Documentation

4.11.2.1 StrokingActuator()

```
StrokingActuator::StrokingActuator (
            int pin)  [inline]
```

Constructor for StrokingActuator.

Initializes the stroking actuator by attaching the servo to the specified pin and setting it to the initial position (0 degrees).

Parameters

pin	The GPIO pin to which the actuator is connected.

< Attach the servo to the specified pin.

< Set servo to 0 degrees initially.

4.11.3 Member Function Documentation

4.11.3.1 activate()

```
void StrokingActuator::activate ()  [inline], [override], [virtual]
```

Activates the stroking actuator.

Moves the servo to 180 degrees to simulate a stroking motion. < Move the servo to 180 degrees.

Implements Actuator.

4.11.3.2 deactivate()

```
void StrokingActuator::deactivate ()  [inline], [override], [virtual]
```

Deactivates the stroking actuator.

Moves the servo back to 0 degrees. < Move the servo back to 0 degrees.

Implements Actuator.

The documentation for this class was generated from the following file:

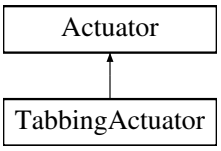
- src/ActuatorTypes/StrokingActuator.h

4.12 TabbingActuator Class Reference

A class representing a tabbing actuator.

```
#include <TabbingActuator.h>
```

Inheritance diagram for TabbingActuator:



Public Member Functions

- TabbingActuator (int pin)
  Constructor for TabbingActuator.
- void activate () override
  Activates the tabbing actuator.
- void deactivate () override
  Deactivates the tabbing actuator.

Public Member Functions inherited from Actuator

- Actuator (int pin, ActuatorType type)
  Constructor for the Actuator class.

Additional Inherited Members

Protected Attributes inherited from Actuator

- int **pin**
  GPIO pin number the actuator is connected to.
- ActuatorType **actuatorType**
  Type of actuator (e.g., vibration, stroking, tabbing).
- bool **turnedOn** = false
  Flag to check if the actuator is currently active.

4.12.1 Detailed Description

A class representing a tabbing actuator.

This actuator is designed to create a tapping or tabbing sensation using a servo motor.

4.12.2 Constructor & Destructor Documentation

4.12.2.1 TabbingActuator()

```
TabbingActuator::TabbingActuator (
            int pin)  [inline]
```

Constructor for TabbingActuator.

Initializes the tabbing actuator by attaching the servo to the specified pin and setting it to the initial position (180 degrees).

Parameters

pin	The GPIO pin to which the actuator is connected.

< Attach the servo to the specified pin.

< Set servo to 180 degrees initially.

4.12.3 Member Function Documentation

4.12.3.1 activate()

```
void TabbingActuator::activate ()  [inline], [override], [virtual]
```

Activates the tabbing actuator.

Moves the servo to 90 degrees to simulate a tabbing motion. < Move the servo to 90 degrees.

Implements Actuator.

4.12.3.2 deactivate()

```
void TabbingActuator::deactivate ()  [inline], [override], [virtual]
```

Deactivates the tabbing actuator.

Moves the servo back to 180 degrees. < Move the servo back to 180 degrees.

Implements Actuator.

The documentation for this class was generated from the following file:

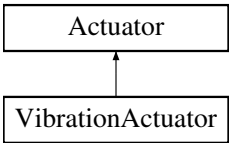
- src/ActuatorTypes/TabbingActuator.h

4.13 VibrationActuator Class Reference

A class representing a vibration actuator.

`#include <VibrationActuator.h>`

Inheritance diagram for VibrationActuator:



Public Member Functions

- VibrationActuator (int pin)
  Constructor for VibrationActuator.
- void activate () override
  Activates the vibration actuator.
- void deactivate () override
  Deactivates the vibration actuator.

Public Member Functions inherited from Actuator

- Actuator (int pin, ActuatorType type)
  Constructor for the Actuator class.

Additional Inherited Members

Protected Attributes inherited from Actuator

- int **pin**
  GPIO pin number the actuator is connected to.
- ActuatorType **actuatorType**
  Type of actuator (e.g., vibration, stroking, tabbing).
- bool **turnedOn** = false
  Flag to check if the actuator is currently active.

4.13.1 Detailed Description

A class representing a vibration actuator.

This actuator uses a digital output pin to control a vibration motor.

4.13.2 Constructor & Destructor Documentation

4.13.2.1 VibrationActuator()

```
VibrationActuator::VibrationActuator (
            int pin)  [inline]
```

Constructor for VibrationActuator.

Initializes the vibration actuator by setting the specified pin as an output and turning off the vibration motor initially.

Parameters

pin	The GPIO pin to which the actuator is connected.

< Set the pin as an output.

< Ensure the actuator is off initially.

4.13.3 Member Function Documentation

4.13.3.1 activate()

```
void VibrationActuator::activate ()  [inline], [override], [virtual]
```

Activates the vibration actuator.

Turns on the vibration motor if it is not already on. < Turn on vibration.

Implements Actuator.

4.13.3.2 deactivate()

```
void VibrationActuator::deactivate ()  [inline], [override], [virtual]
```

Deactivates the vibration actuator.

Turns off the vibration motor if it is currently on. < Turn off vibration.

Implements Actuator.

The documentation for this class was generated from the following file:

- src/ActuatorTypes/VibrationActuator.h

4.14 WifiMaster Class Reference

Public Member Functions

- **WifiMaster** (GloveModel gloveModel)
- void **setup** ()
- void **loop** ()
- void **sendVectorToSlave** (const std::vector< int > &reorderedValues, const ChordingScheme status, int repeat)
- void **sendVectorToSlave** (const std::vector< int > &reorderedValues, const ChordingScheme status)

The documentation for this class was generated from the following files:

- src/Master/WifiMaster.h
- src/Master/WifiMaster.cpp

4.15 WifiSlave Class Reference

Public Member Functions

- **WifiSlave** (GloveModel gloveModel)
- void **setup** ()
- void **loop** ()
- void **processMessage** (const uint8_t ∗mac, const uint8_t ∗buf, size_t count)

Static Public Member Functions

- static void **onReceiveCallback** (const uint8_t ∗mac, const uint8_t ∗buf, size_t count, void ∗arg)

The documentation for this class was generated from the following files:

- src/Slave/WifiSlave.h
- src/Slave/WifiSlave.cpp

Chapter 5

File Documentation

5.1 Actuator.h

```
00001 #ifndef ACTUATOR_H
00002 #define ACTUATOR_H
00003
00004 #include "ActuatorType.h"
00005
00006 #ifdef UNIT_TEST
00007     #include "../test/Mocks/Servo_Mock.h"
00008 #else
00009     #include <Servo.h>
00010     #include <Arduino.h>
00011 #endif
00012
00013
00020 class Actuator {
00021   protected:
00022     int pin;
00023     ActuatorType actuatorType;
00024     bool turnedOn = false;
00025
00026   public:
00032     Actuator(int pin, ActuatorType type) : pin(pin), actuatorType(type) {}
00033
00040     virtual void activate() = 0;
00041
00048     virtual void deactivate() = 0;
00049 };
00050
00051 #endif // ACTUATOR_H
```

5.2 ActuatorType.h

```
00001 #ifndef ACTUATOR_TYPE_H
00002 #define ACTUATOR_TYPE_H
00003
00010 enum ActuatorType {
00011     Vibration,
00012     Tabbing,
00013     Stroking
00014 };
00015
00016 #endif // ACTUATOR_TYPE_H
```

5.3 StrokingActuator.h

```
00001 #ifndef STROKING_ACTUATOR_H
00002 #define STROKING_ACTUATOR_H
00003
00004 #include "Actuator.h"
```

```
00005
00012 class StrokingActuator : public Actuator {
00013   private:
00014     Servo servo;
00015
00016   public:
00025     StrokingActuator(int pin) : Actuator(pin, Stroking) {
00026         servo.attach(pin);
00027         servo.write(0);
00028         turnedOn = false;
00029     }
00030
00036     void activate() override {
00037         turnedOn = true;
00038         servo.write(180);
00039     }
00040
00046     void deactivate() override {
00047         turnedOn = false;
00048         servo.write(0);
00049     }
00050 };
00051
00052 #endif // STROKING_ACTUATOR_H
```

5.4 TabbingActuator.h

```
00001 #ifndef TABBING_ACTUATOR_H
00002 #define TABBING_ACTUATOR_H
00003
00004 #include "Actuator.h"
00005
00012 class TabbingActuator : public Actuator {
00013   private:
00014     Servo servo;
00015
00016   public:
00025     TabbingActuator(int pin) : Actuator(pin, Stroking) {
00026         servo.attach(pin);
00027         servo.write(180);
00028         turnedOn = false;
00029     }
00030
00036     void activate() override {
00037         turnedOn = true;
00038         servo.write(90);
00039     }
00040
00046     void deactivate() override {
00047         turnedOn = false;
00048         servo.write(180);
00049     }
00050 };
00051
00052 #endif // TABBING_ACTUATOR_H
```

5.5 VibrationActuator.h

```
00001 #ifndef VIBRATION_ACTUATOR_H
00002 #define VIBRATION_ACTUATOR_H
00003
00004 #include "Actuator.h"
00005
00012 class VibrationActuator : public Actuator {
00013   public:
00022     VibrationActuator(int pin) : Actuator(pin, Vibration) {
00023         pinMode(pin, OUTPUT);
00024         digitalWrite(pin, LOW);
00025         turnedOn = false;
00026     }
00027
00033     void activate() override {
00034         if (!turnedOn) {
00035             turnedOn = true;
00036             digitalWrite(pin, HIGH);
00037         }
00038     }
00039
```

```
00045     void deactivate() override {
00046         if (turnedOn) {
00047             turnedOn = false;
00048             digitalWrite(pin, LOW);
00049         }
00050     }
00051 };
00052
00053 #endif // VIBRATION_ACTUATOR_H
```

5.6 Controller.h

```
00001 #ifndef CONTROLLER_H
00002 #define CONTROLLER_H
00003
00004 #ifdef UNIT_TEST
00005     #include "../test/Mocks/ESP8266WiFi_Mock.h"
00006     #include "../test/Mocks/MockWiFiUDP.h"
00007     #include "../test/Mocks/new_Arduino_Mock.h"
00008     #include "../test/Mocks/ESPNOW_Mock.h"
00009     #include "../test/Mocks/ESP_Mock.h"
00010 #else
00011     #include <ESP8266WiFi.h>
00012     #include <ESP8266WebServer.h>
00013     #include <WiFiUdp.h>
00014 #endif
00015
00016 #include <vector>
00017 #include "../Models/GloveModel.h"
00018 #include "../ActuatorTypes/VibrationActuator.h"
00019 #include "../Mapper/ActuatorProcessingOrderMapper.h"
00020 #include "../Mapper/BrailleMapper.h"
00021 #include "../Models/HandEnum.h"
00022 #include "../Master/WifiMaster.h"
00023 #include "../Slave/WifiSlave.h"
00024
00032 class Controller {
00033 public:
00041     Controller(bool isSlave);
00042
00049     void setup();
00050
00056     void loop();
00057
00058 private:
00059     bool isSlave;
00060     WifiMaster* master;
00061     WifiSlave* slave;
00062
00068     void initializeMaster();
00069
00075     void initializeSlave();
00076 };
00077
00078
00079 #endif // CONTROLLER_H
```

5.7 ActuatorProcessingOrderMapper.h

```
00001 #ifndef ACTUATOR_PROCESSING_ORDER_MAPPER_H
00002 #define ACTUATOR_PROCESSING_ORDER_MAPPER_H
00003
00004 #ifdef UNIT_TEST
00008     class ActuatorProcessingOrderMapperTestHelper;
00009 #endif
00010
00011 #include <unordered_map>
00012 #include <vector>
00013
00021 class ActuatorProcessingOrderMapper {
00022 private:
00029     std::unordered_map<int, int> SENSITIVITY_ORDER;
00030
00037     void initializeSensitivityOrder();
00038
00048     int reorderBySensitivity(int number);
00049
00050 public:
```

```
00056     ActuatorProcessingOrderMapper();
00057
00067     std::vector<int> reorderVectorBySensitivity(const std::vector<int>& values);
00068
00069 #ifdef UNIT_TEST
00073     friend class ActuatorProcessingOrderMapperTestHelper;
00074 #endif
00075 };
00076
00077 #endif // ACTUATOR_PROCESSING_ORDER_MAPPER_H
```

5.8 BrailleMapper.h

```
00001 #ifndef BRAILLEMAPPER_H
00002 #define BRAILLEMAPPER_H
00003
00004 #ifdef UNIT_TEST
00005     #include "../test/Mocks/String_Mock.h"
00009     class BrailleMapperTestHelper;
00010 #else
00011     #include <Arduino.h>
00012 #endif
00013
00014 #include <unordered_map>
00015 #include <vector>
00016
00024 class BrailleMapper {
00025 private:
00031     std::unordered_map<char, int> brailleMap;
00032
00038     void initializeBrailleMap();
00039
00040 public:
00044     BrailleMapper();
00045
00052     int getBrailleHash(char letter) const;
00053
00063     std::vector<int> stringToIntegerList(const String& input) const;
00064
00065 #ifdef UNIT_TEST
00069     friend class BrailleMapperTestHelper;
00070 #endif
00071 };
00072
00073 #endif // BRAILLEMAPPER_H
```

5.9 WifiMaster.h

```
00001 #ifndef WIFI_MASTER_H
00002 #define WIFI_MASTER_H
00003
00004 #ifdef UNIT_TEST
00005     #ifndef ARDUINO_MOCK_H
00006         #pragma once
00007         #include "../test/Mocks/new_Arduino_Mock.h"
00008     #endif
00009
00010     #include "../test/Mocks/ESP8266WiFi_Mock.h"
00011     #include "../test/Mocks/MockWiFiUDP.h"
00012     #include "../test/Mocks/LittleFS_Mock.h"
00013     #include "../test/Mocks/ESPNOW_Mock.h"
00014     #include "../test/Mocks/ESP_Mock.h"
00015
00016     extern LittleFSMock LittleFS;
00017     #define File MockFile
00018     extern MockWiFi WiFi;
00019     extern MockWifiEspNow WifiEspNow;
00020
00021 #else
00022     #include <ESP8266WiFi.h>
00023     #include <ESP8266WebServer.h>
00024     #include <WiFiUdp.h>
00025     #include <WiFiServer.h>  // Include for TCP server
00026     #include <LittleFS.h>
00027     #include <WifiEspNow.h>
00028
00029 #endif
00030
```

```
00031 #include <vector>
00032
00033 #include <cstring>
00034
00035 #include "Mapper/BrailleMapper.h"
00036 #include "Mapper/ActuatorProcessingOrderMapper.h"
00037 #include "Models/GloveModel.h"
00038 #include "Models/EncodingScheme/ChordingScheme.h"
00039 #include "Models/HandEnum.h"
00040 #include "../Settings/SingeltonWifiSettings.h"
00041
00042 class WifiMaster {
00043 public:
00044     WifiMaster(GloveModel gloveModel);
00045     void setup();
00046     void loop();
00047
00048     void sendVectorToSlave(const std::vector<int> &reorderedValues, const ChordingScheme status, int
      repeat);
00049
00050     void sendVectorToSlave(const std::vector<int> &reorderedValues, const ChordingScheme status);
00051
00052 private:
00053     int idx;
00054     String pattern;
00055     ESP8266WebServer server;
00056
00057     // View view;
00058     BrailleMapper brailleMapper = BrailleMapper();
00059     ActuatorProcessingOrderMapper queue = ActuatorProcessingOrderMapper();
00060     GloveModel gloveModel;
00061     // DataSender dataSender;
00062
00063     void sendVectorToSlave(std::vector<int> reorderedValues);
00064     void sendIntegerToSlave(int singleValueToSend);
00065     void setFrontend();
00066     void frontendSetPattern(String pattern, ChordingScheme status, bool longPattern);
00067     void printConnectedDevices();
00068     void frontendSetPattern(String pattern, ChordingScheme status);
00069     void computePatternAndDistribute(String text, ChordingScheme status, bool longPattern);
00070     std::vector<int> computePatternFromText(String text);
00071     void distributePatternToGloves(std::vector<int> pattern);
00072     void startFunction();
00073     void frontendAjaxCall();
00074
00075     void customDelay(unsigned long timeInMs){ //this is needed for wifi compatability
00076       unsigned long startMillis = millis();  // Get the current time
00077       while (millis() - startMillis < timeInMs) {
00078           yield();  //the programm doesn't stop
00079       }
00080     }
00081 };
00082 #endif // WIFI_MASTER_H
```

5.10 ChordingScheme.h

```
00001 #ifndef CHORDING_SCHEME_H
00002 #define CHORDING_SCHEME_H
00003
00011 enum ChordingScheme {
00012     OST_ENCODING,
00013     SEQUENTIAL_ENCODING
00014 };
00015
00016 #endif
```

5.11 Encoding.h

```
00001 #ifndef ENCODING_H
00002 #define ENCODING_H
00003
00004 #ifdef UNIT_TEST
00005     #ifndef ARDUINO_MOCK_H
00006         #pragma once
00007         #include "../test/Mocks/new_Arduino_Mock.h"
00008     #endif
00009 #else
00010     #include <Arduino.h>
```

```
00011 #endif
00012
00019 class Encoding {
00020 public:
00029     static void customDelay(unsigned long timeInMs) {
00030         unsigned long startMillis = millis();
00031         while (millis() - startMillis < timeInMs) {
00032             yield();
00033         }
00034     }
00035
00046     static bool validIndex(int number, Hand hand){
00047         if ((hand == Left && number > SingeltonGloveSettings::getInstance().NUM_ACTUATORS) ||
00048             (hand == Right && number < SingeltonGloveSettings::getInstance().NUM_ACTUATORS + 1)) {
00049             return false;
00050         } else {
00051             return true;
00052         }
00053     }
00054 };
00055
00056 #endif
```

5.12 OSTEncoding.h

```
00001 #ifndef OST_ENCODING_H
00002 #define OST_ENCODING_H
00003
00004 #include "../../ActuatorTypes/Actuator.h"
00005 #include "../../Settings/SingeltonGloveSettings.h"
00006 #include "../../Models/HandEnum.h"
00007 #include "Encoding.h"
00008
00015 class OSTEncoding : public Encoding {
00016 public:
00028     static void handle(int number, Actuator** actuators, Hand hand) {
00029         if (validIndex(number, hand)) {
00030             int actuatorIdx = (number - 1) % SingeltonGloveSettings::getInstance().NUM_ACTUATORS;
00031             actuators[actuatorIdx]->activate();
00032         }
00033         customDelay(SingeltonGloveSettings::getInstance().OST_OFFSET);
00034     }
00035 };
00036
00037 #endif
```

5.13 SequentialEncoding.h

```
00001 #ifndef SEQUENTIAL_ENCODING_H
00002 #define SEQUENTIAL_ENCODING_H
00003
00004 #include "../../ActuatorTypes/Actuator.h"
00005 #include "../../Settings/SingeltonGloveSettings.h"
00006 #include "../../Models/HandEnum.h"
00007 #include "Encoding.h"
00008
00015 class SequentialEncoding : public Encoding {
00016 public:
00028     static void handle(int number, Actuator** actuators, Hand hand) {
00029         if (validIndex(number, hand)) {
00030             int actuatorIdx = (number - 1) % SingeltonGloveSettings::getInstance().NUM_ACTUATORS;
00031             actuators[actuatorIdx]->activate();
00032             customDelay(SingeltonGloveSettings::getInstance().DURATION);
00033             actuators[actuatorIdx]->deactivate();
00034             customDelay(SingeltonGloveSettings::getInstance().SEQ_OFFSET);
00035         } else {
00036             customDelay(SingeltonGloveSettings::getInstance().DURATION);
00037             customDelay(SingeltonGloveSettings::getInstance().SEQ_OFFSET);
00038         }
00039     }
00040 };
00041
00042 #endif
```

5.14 GloveModel.h

```
00001 #ifndef GLOVE_MODEL_H
00002 #define GLOVE_MODEL_H
00003
00004 #ifdef UNIT_TEST
00005 #else
00006     #include <Arduino.h>
00007 #endif
00008
00009 #include <unordered_map>
00010 #include <vector>
00011 #include "../ActuatorTypes/Actuator.h"
00012 #include "../Models/HandEnum.h"
00013 #include "../Settings/SingeltonGloveSettings.h"
00014 #include "./EncodingScheme/ChordingScheme.h"
00015 #include "./EncodingScheme/SequentialEncoding.h"
00016 #include "./EncodingScheme/OSTEncoding.h"
00017
00018 class GloveModel {
00019 private:
00020     Actuator* actuators[3];
00021     Hand hand;
00022     std::vector<int> values;
00023     ChordingScheme playMode;
00024
00025 public:
00026     GloveModel(Hand hand, Actuator& actuator1, Actuator& actuator2, Actuator& actuator3) {
00027         actuators[0] = &actuator1;
00028         actuators[1] = &actuator2;
00029         actuators[2] = &actuator3;
00030         this->hand = hand;
00031     }
00032
00033     void resetAllActuators() {
00034         for (int i = 0; i < SingeltonGloveSettings::getInstance().NUM_ACTUATORS; i++) {
00035             if (actuators[i] != nullptr) {
00036                 actuators[i]->deactivate();
00037             }
00038         }
00039     }
00040
00041     void executePatternAt(int index) {
00042         resetAllActuators();
00043         vibrateOnNumber(values[index]);
00044     }
00045
00046     void pauseBetweenLetters(){
00047         SequentialEncoding::customDelay(SingeltonGloveSettings::getInstance().DURATION);
00048         resetAllActuators();
00049         SequentialEncoding::customDelay(SingeltonGloveSettings::getInstance().PAUSE);
00050     }
00051
00052     void vibrateOnNumber(int number) {
00053         if (number < 1) {   // -1 is a pause, so reset every actuator
00054             pauseBetweenLetters();
00055             return;
00056         }
00057         while (number > 0) {
00058             int lastDigit = number % 10;
00059             number = (int)number / 10;
00060
00061             if (playMode == SEQUENTIAL_ENCODING) {
00062                 SequentialEncoding::handle(lastDigit, actuators, hand);
00063             } else {
00064                 OSTEncoding::handle(lastDigit, actuators, hand);
00065             }
00066         }
00067         if(playMode == OST_ENCODING){
00068             SequentialEncoding::customDelay(SingeltonGloveSettings::getInstance().DURATION);
00069             resetAllActuators();
00070         }
00071         SequentialEncoding::customDelay(SingeltonGloveSettings::getInstance().PAUSE);
00072     }
00073
00074     void setPattern(std::vector<int> newValues) {
00075         values = newValues;
00076     }
00077
00078     std::vector<int> getPattern() {
00079         return values;
00080     }
00081
00082     int getPatternLength() {
00083         return values.size();
00084     }
```

```
00085
00086     void setChordMode(ChordingScheme chordMode) {
00087         playMode = chordMode;
00088     }
00089 };
00090
00091 #endif
```

5.15 HandEnum.h

```
00001 #ifndef HAND_ENUM_H
00002 #define HAND_ENUM_H
00003
00004 enum Hand {
00005     Left,
00006     Right
00007 };
00008
00009 #endif
```

5.16 SingeltonGloveSettings.h

```
00001 #ifndef SINGELTON_GLOVE_SETTINGS
00002 #define SINGELTON_GLOVE_SETTINGS
00003
00004
00005 class SingeltonGloveSettings {
00006     private:
00007         SingeltonGloveSettings() {}
00008         SingeltonGloveSettings(const SingeltonGloveSettings&) = delete;
00009         void operator=(const SingeltonGloveSettings&) = delete;
00010
00011     public:
00012         static SingeltonGloveSettings& getInstance() {
00013             static SingeltonGloveSettings instance;
00014             return instance;
00015         }
00016
00017         //TODO change settings accordingly
00018         const int OST_OFFSET = 10;
00019         const int DURATION = 200;
00020         const int PAUSE = 2000;
00021         const int NUM_ACTUATORS = 3;
00022         const int AUDIO_VIBRATION_OFFSET = 100;
00023
00024         const int SEQ_OFFSET = 1000;
00025         const int studyOstRepititions = 126;
00026         const int studySeqRepititions = 44;
00027
00028
00029 };
00030
00031 #endif
```

5.17 SingeltonWifiSettings.h

```
00001 #include <cstdint>
00002 #ifndef SINGELTON_WIFI_SETTINGS
00003 #define SINGELTON_WIFI_SETTINGS
00004
00005
00006 class SingeltonWifiConnector {
00007     private:
00008         SingeltonWifiConnector() {}
00009         SingeltonWifiConnector(const SingeltonWifiConnector&) = delete;
00010         void operator=(const SingeltonWifiConnector&) = delete;
00011
00012     public:
00013         static SingeltonWifiConnector& getInstance() {
00014             static SingeltonWifiConnector instance;
00015             return instance;
00016         }
00017
```

```
00018         const char* MASTER_SSID = "MV-Glove";
00019         const char* SLAVE_SSID = "VS-Glove";
00020         const uint8_t SLAVE_MAC[6] = {0x48, 0x55, 0x19, 0xF6, 0xC9, 0xB3}; //use the right slave mac
00021 };
00022
00023 #endif
```

5.18 WifiSlave.h

```
00001 #ifndef WIFI_SLAVE_H
00002 #define WIFI_SLAVE_H
00003
00004 #ifdef UNIT_TEST
00005     #include "../test/Mocks/ESP8266WiFi_Mock.h"
00006     #include "../test/Mocks/MockWiFiUDP.h"
00007     #include "../test/Mocks/ESPNOW_Mock.h"
00008     #include "../test/Mocks/ESP_Mock.h"
00009
00010 #else
00011     #include <ESP8266WiFi.h>
00012     #include <ESP8266WebServer.h>
00013     #include <WiFiUdp.h>
00014     #include <WiFiServer.h>  // Include for TCP server
00015     #include <LittleFS.h>
00016     #include <WifiEspNow.h>
00017
00018 #endif
00019
00020 #include <vector>
00021
00022 #include "Models/GloveModel.h"
00023
00024 class WifiSlave {
00025 public:
00026     WifiSlave(GloveModel gloveModel);
00027     void setup();
00028     void loop();
00029     static void onReceiveCallback(const uint8_t* mac, const uint8_t* buf, size_t count, void* arg);
00030     void processMessage(const uint8_t* mac, const uint8_t* buf, size_t count);
00031
00032 private:
00033     GloveModel gloveModel;
00034     bool hasPatternFlag = false;
00035     bool nextCharacterFlag = false;
00036     int characterIndex = 0;
00037
00038     void runProgram();
00039     void receivedIndex(int index);
00040     void receivedPatten(std::vector<int> sensitivityPattern);
00041 };
00042
00043 #endif // WIFI_SLAVE_H
```

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