

# ME 507 Term Project

Final

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# Chapter 1

## File Index

### 1.1 File List

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

<a href="#">main.c</a>	: Main program body . . . . .	3
<a href="#">main.h</a>	: Header for <a href="#">main.c</a> file. This file contains the common defines of the application . . . . .	10



# Chapter 2

## File Documentation

### 2.1 main.c File Reference

: Main program body

```
#include "main.h"
```

#### Functions

- void [SystemClock\\_Config](#) (void)  
*System Clock Configuration.*
- int [main](#) (void)  
*The application entry point.*
- void [Error\\_Handler](#) (void)  
*This function is executed in case of error occurrence.*

#### Variables

- ADC\_HandleTypeDef **hadc1**
- double [pot\\_dist\\_in\\_1](#) = 3.25  
*Declare and define all variables.*
- double [pot\\_dist\\_in\\_2](#) = 7.75
- double [pot\\_dist\\_in\\_3](#) = 11.25
- double [pot\\_dist\\_in\\_4](#) = 14.25
- double [steps\\_per\\_inch](#) = 2031
- double **pot\_dist\_steps\_1**
- double **pot\_dist\_steps\_2**
- double **pot\_dist\_steps\_3**
- double **pot\_dist\_steps\_4**
- double **pot\_dist\_steps\_ARR** [4]
- double [dry\\_reading](#) = 3800
- double [wet\\_reading](#) = 1700
- double [plant\\_min\\_moist\\_perc\\_1](#) = 40
- double [plant\\_min\\_moist\\_perc\\_2](#) = 40
- double [plant\\_min\\_moist\\_perc\\_3](#) = 40

- double `plant_min_moist_perc_4` = 40
- double `plant_moist_overshot_perc_1` = 65
- double `plant_moist_overshot_perc_2` = 65
- double `plant_moist_overshot_perc_3` = 65
- double `plant_moist_overshot_perc_4` = 65
- int `count_max` = 50
- int `delay_between_moist_check_ms` = 1000\*60\*5
- double `plant_min_moist_mV_1`
- double `plant_overshoot_moist_mV_1`
- double `plant_min_moist_mV_2`
- double `plant_overshoot_moist_mV_2`
- double `plant_min_moist_mV_3`
- double `plant_overshoot_moist_mV_3`
- double `plant_min_moist_mV_4`
- double `plant_overshoot_moist_mV_4`
- double `plant_min_moist_mV_ARR` [4]
- double `plant_moist_overshoot_mV_ARR` [4]
- int `delay_between_moist_reading_ms` = 1000
- int `delay_durring_pumping_ms` = 1000
- int `delay_between_pumps_ms` = 3000
- int `PWM_half_delay` = 1
- int `count`
- double `current_moist_reading_ARR` [4]
- int `needs_water` [4]
- int `needs_water_flg`
- int `i`
- int `j`
- int `k`
- int `temp`
- int `home_flg`
- double `steps_to_take`
- int `step_num`

### 2.1.1 Detailed Description

: Main program body

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### 2.1.2 Function Documentation

#### 2.1.2.1 Error\_Handler()

```
void Error_Handler (
    void )
```

This function is executed in case of error occurrence.

Function to handle errors.



## Return values

<i>None</i>	
-------------	--

### 2.1.2.2 main()

```
int main (  
        void )
```

The application entry point.

## Return values

<i>int</i>	
------------	--

Collect data from sensors

< Turn on sensors

< Store measurements in an array

< Turn off sensors

Process data from sensors

< Turn on the error LED

< Stop running

Water plants with closed loop feedback

< Enable motor

< Set motor direction

< Drive motor

< Disable motor

< Turn on pump briefly

< Turn off pump

< Longer delay between checks for moisture levels

### 2.1.2.3 SystemClock\_Config()

```
void SystemClock_Config (  
        void )
```

System Clock Configuration.

#### Return values

<i>None</i>	
-------------	--

Configure the main internal regulator output voltage

Initializes the RCC Oscillators according to the specified parameters in the RCC\_OscInitTypeDef structure.

Initializes the CPU, AHB and APB buses clocks

### 2.1.3 Variable Documentation

#### 2.1.3.1 count

```
int count
```

Counter variable

#### 2.1.3.2 count\_max

```
int count_max = 50
```

Maximum count before the robot stops operating

#### 2.1.3.3 current\_moist\_reading\_ARR

```
double current_moist_reading_ARR[4]
```

Array to store current moisture readings

#### 2.1.3.4 delay\_between\_moist\_check\_ms

```
int delay_between_moist_check_ms = 1000*60*5
```

Delay between moisture level checks (5 minutes)

#### 2.1.3.5 delay\_between\_moist\_reading\_ms

```
int delay_between_moist_reading_ms = 1000
```

Delay between moisture readings (1 second)

#### 2.1.3.6 delay\_between\_pumps\_ms

```
int delay_between_pumps_ms = 3000
```

Delay between pumps (3 seconds)

### 2.1.3.7 delay\_durring\_pumping\_ms

```
int delay_durring_pumping_ms = 1000
```

Delay during pumping (1 second)

### 2.1.3.8 dry\_reading

```
double dry_reading = 3800
```

Dry sensor reading calibration value

### 2.1.3.9 home\_flg

```
int home_flg
```

Flag to indicate if the stepper motor is at home position (1 if at home, 0 if not)

### 2.1.3.10 i

```
int i
```

Loop index

### 2.1.3.11 j

```
int j
```

Loop index

### 2.1.3.12 k

```
int k
```

Loop index

### 2.1.3.13 needs\_water

```
int needs_water[4]
```

Array to indicate if a plant needs water (1 if needs water, 0 if not)

### 2.1.3.14 needs\_water\_flg

```
int needs_water_flg
```

Flag to indicate if any plant needs water (1 if any plant needs water, 0 if not)

**2.1.3.15 plant\_min\_moist\_perc\_1**

```
double plant_min_moist_perc_1 = 40
```

Minimum moisture percentage for plant 1

**2.1.3.16 plant\_min\_moist\_perc\_2**

```
double plant_min_moist_perc_2 = 40
```

Minimum moisture percentage for plant 2

**2.1.3.17 plant\_min\_moist\_perc\_3**

```
double plant_min_moist_perc_3 = 40
```

Minimum moisture percentage for plant 3

**2.1.3.18 plant\_min\_moist\_perc\_4**

```
double plant_min_moist_perc_4 = 40
```

Minimum moisture percentage for plant 4

**2.1.3.19 plant\_moist\_overshot\_perc\_1**

```
double plant_moist_overshot_perc_1 = 65
```

Moisture overshoot percentage for plant 1

**2.1.3.20 plant\_moist\_overshot\_perc\_2**

```
double plant_moist_overshot_perc_2 = 65
```

Moisture overshoot percentage for plant 2

**2.1.3.21 plant\_moist\_overshot\_perc\_3**

```
double plant_moist_overshot_perc_3 = 65
```

Moisture overshoot percentage for plant 3

**2.1.3.22 plant\_moist\_overshot\_perc\_4**

```
double plant_moist_overshot_perc_4 = 65
```

Moisture overshoot percentage for plant 4

### 2.1.3.23 pot\_dist\_in\_1

```
double pot_dist_in_1 = 3.25
```

Declare and define all variables.

ALL USER DEFINED INPUTS ARE HERE IN THE VARIABLE DECLARATION Distance in inches for potentiometer 1

### 2.1.3.24 pot\_dist\_in\_2

```
double pot_dist_in_2 = 7.75
```

Distance in inches for potentiometer 2

### 2.1.3.25 pot\_dist\_in\_3

```
double pot_dist_in_3 = 11.25
```

Distance in inches for potentiometer 3

### 2.1.3.26 pot\_dist\_in\_4

```
double pot_dist_in_4 = 14.25
```

Distance in inches for potentiometer 4

### 2.1.3.27 step\_num

```
int step_num
```

Number of steps for the stepper motor to move

### 2.1.3.28 steps\_per\_inch

```
double steps_per_inch = 2031
```

Number of steps the stepper motor must take to move the nozzle 1 inch

### 2.1.3.29 steps\_to\_take

```
double steps_to_take
```

Number of steps the stepper motor needs to take

### 2.1.3.30 temp

```
int temp
```

Temporary variable

### 2.1.3.31 wet\_reading

```
double wet_reading = 1700
```

Wet sensor reading calibration value

## 2.2 main.h File Reference

: Header for [main.c](#) file. This file contains the common defines of the application.

```
#include "stm32f4xx_hal.h"
```

### Functions

- void [Error\\_Handler](#) (void)  
*Function to handle errors.*

### 2.2.1 Detailed Description

: Header for [main.c](#) file. This file contains the common defines of the application.

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### 2.2.2 Function Documentation

#### 2.2.2.1 Error\_Handler()

```
void Error_Handler (  
    void )
```

Function to handle errors.

Function to handle errors.

## Return values

None	
------	--

## 2.3 main.h

[Go to the documentation of this file.](#)

```

00001
00018 /* Define to prevent recursive inclusion -----*/
00019 #ifndef __MAIN_H
00020 #define __MAIN_H
00021
00022 #ifdef __cplusplus
00023 extern "C" {
00024 #endif
00025
00026 /* Includes -----*/
00027 #include "stm32f4xx_hal.h"
00028
00029 /* Private includes -----*/
00030 /* USER CODE BEGIN Includes */
00031
00032 /* USER CODE END Includes */
00033
00034 /* Exported types -----*/
00035 /* USER CODE BEGIN ET */
00036
00037 /* USER CODE END ET */
00038
00039 /* Exported constants -----*/
00040 /* USER CODE BEGIN EC */
00041
00042 /* USER CODE END EC */
00043
00044 /* Exported macro -----*/
00045 /* USER CODE BEGIN EM */
00046
00047 /* USER CODE END EM */
00048
00049 /* Exported functions prototypes -----*/
00053 void Error_Handler(void);
00054
00055 /* USER CODE BEGIN EFP */
00056
00057 /* USER CODE END EFP */
00058
00059 /* Private defines -----*/
00060 /* USER CODE BEGIN Private defines */
00061
00062 /* USER CODE END Private defines */
00063
00064 #ifdef __cplusplus
00065 }
00066 #endif
00067
00068 #endif /* __MAIN_H */

```





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