APPENDIX

CODING SMART TRASH CAN

```
#include <avr/pgmspace.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include <Servo.h>
#include <Fuzzy.h>
#include "HX711.h"


#define PIR   6
#define Echo  5
#define Trig  4
#define LOADCELL_DOUT_PIN  A0
#define LOADCELL_SCK_PIN   A1

LiquidCrystal_I2C lcd(0x27, 16, 2);
Servo Tutup;
HX711 Scale;

//*************** FUZZY ***************//
Fuzzy *fuzzy = new Fuzzy();

//Fuzzy Jarak
FuzzySet *Tinggi = new FuzzySet(30, 30, 60, 120);
FuzzySet *Cukup = new FuzzySet(60, 120, 120, 180);
FuzzySet *Rendah = new FuzzySet(120, 180, 210, 210);

//Fuzzy Beban
FuzzySet *Ringan = new FuzzySet(0, 0, 500, 1500);
FuzzySet *Sedang = new FuzzySet(500, 1500, 1500, 2500);
FuzzySet *Berat = new FuzzySet(1500, 2500, 3000, 3000);

//Fuzzy Output
FuzzySet *Sedikit = new FuzzySet(0, 0, 20, 40);
FuzzySet *Lumayan = new FuzzySet(20, 40, 60, 80);
FuzzySet *Penuh = new FuzzySet(60, 80, 100, 100);
//***************** END *****************//

//*************** VARIABLE ***************//
float deffuzy = 0, y1 = 810, y2 = 1883, y3 = 3198;
uint8_t a1 = 40, a2 = 40, a3 = 40;
const String Satuan = " %  ";
String Kondisi = "";
uint32_t Durasi = 0;
uint8_t JarakCm, dJarakCm;
float Persen;
boolean sensorValue;

unsigned long previousMillis = 0;
const long interval = 1000;

float berat;            //variabel berat
//***************** END *****************//

void setup() {
  Serial.begin(9600);

```

```
57.
58.     //Inisialisasi Pin
59.     pinMode(PIR, INPUT);
60.     pinMode(Trig, OUTPUT);
61.     pinMode(Echo, INPUT);
62.
63.     Tutup.attach(9);
64.     Tutup.write(0);
65.
66.     //LCD
67.     lcd.begin();
68.     lcd.backlight();
69.     lcd.clear();
70.     //END
71.
72.     //Scale
73.     Serial.println();
74.     Serial.println(F("Calibrating..."));
75.     lcd.setCursor(0, 0);
76.     lcd.print("Calibrating...");
77.     delay(1000);
78.     Scale.begin(LOADCELL_DOUT_PIN, LOADCELL_SCK_PIN);
79.     Scale.set_scale(480.f);
80.     Scale.tare();
81.     lcd.setCursor(0, 1);
82.     lcd.print("Ready To Use");
83.     Serial.println(F("Ready To Use"));
84.     Serial.println(F("\n"));
85.     delay(2000);
86.     lcd.clear();
87.     //END
88.
89.     //LCD
90.     lcd.setCursor(2, 0);
91.     lcd.print("SMART  TRASH");
92.
93.     SensorJarak();
94.
95.     lcd.setCursor(0, 1);
96.     lcd.print("CAPACITY = ");
97.     lcd.print(dJarakCm, 0);
98.     lcd.print(Satuan);
99.     //END
100.
101.    FuzzyInit();
102.    sensorValue = 0;
103.
104.    //Print Header
105.
Serial.println("**************************************************
**********************");
106.    Serial.println("||    Distance    ||    Weight    ||    Output
||   Persen   ||   Capacity   ||");
107.
Serial.println("**************************************************
**********************");
108.  }
109.
110.  void loop() {
111.    sensorValue = digitalRead(PIR);
112.    TutupSampah(sensorValue, 0, 95, 2000);
```

```
113.
114.    lcd.setCursor(11, 1);
115.    lcd.print(Persen, 2);
116.    lcd.print(Satuan);
117.
118.    unsigned long currentMillis = millis();
119.    if (currentMillis - previousMillis >= interval) {
120.      previousMillis = currentMillis;
121.
122.      if (sensorValue != 1)
123.
124.        SensorJarak();
125.
126.
127.      Scale.power_up();
128.      float load = ScaleRange();
129.
130.      load = load;
131.      fuzzy->setInput(1, dJarakCm);
132.      fuzzy->setInput(2, load);
133.      fuzzy->fuzzify();
134.
135.      deffuzy = ((y1 * Sedikit->getPertinence()) + (y2 * Lumayan-
>getPertinence()) +(y3 * Penuh->getPertinence())) / ((a1 * Sedikit-
>getPertinence()) + (a2 * Lumayan->getPertinence()) + (a3 * Penuh-
>getPertinence()));
136.      float output = deffuzy;
137.      Persen = map(output, 20.25,79.95, 0, 100.00);
138.
139.      if (Sedikit->getPertinence() > Lumayan->getPertinence() &&
Penuh->getPertinence() == 0) {
140.        Kondisi = "Sedikit";
141.      }
142.      if (Sedikit->getPertinence() < Lumayan->getPertinence() &&
Penuh->getPertinence() == 0) {
143.        Kondisi = "Lumayan";
144.      }
145.      if (Lumayan->getPertinence() > Penuh->getPertinence() &&
Sedikit->getPertinence() == 0) {
146.        Kondisi = "Lumayan";
147.      }
148.      if (Lumayan->getPertinence() < Penuh->getPertinence() &&
Sedikit->getPertinence() == 0) {
149.        Kondisi = " Penuh ";
150.      }
151.      if (Sedikit->getPertinence() > Penuh->getPertinence() &&
Lumayan->getPertinence() == 0) {
152.        Kondisi = "Sedikit";
153.      }
154.      if (Sedikit->getPertinence() < Penuh->getPertinence() &&
Lumayan->getPertinence() == 0) {
155.        Kondisi = "Penuh";
156.      }
157.
158.      Serial.print("||   ");
159.      Serial.print(dJarakCm);
160.      if (dJarakCm >= 100)
161.        Serial.print(" mm     || ");
162.      if (dJarakCm <= 99)
163.        Serial.print(" mm      || ");
164.
```

```
165.      Serial.print(load);
166.      if (load <= 9)
167.        Serial.print(" g    ||    ");
168.      if (load >= 10 && load <= 99)
169.        Serial.print(" g   ||    ");
170.      if (load >= 100 && load <= 999)
171.        Serial.print(" g  ||    ");
172.      if (load >= 1000)
173.        Serial.print(" g ||    ");
174.
175.      Serial.print(output);
176.      if (output <= 9)
177.        Serial.print("    ||   ");
178.      if (output >= 10 && output <= 99)
179.        Serial.print("   ||   ");
180.      if (output >= 100)
181.        Serial.print("  ||   ");
182.
183.      Serial.print(Persen);
184.      if (Persen <= 9)
185.        Serial.print("%    ||    ");
186.      if (Persen >= 10 && Persen <= 99)
187.        Serial.print("%   ||    ");
188.      if (Persen >= 100)
189.        Serial.print("%  ||    ");
190.
191.      Serial.print(Kondisi);
192.      Serial.println("   ||");
193.
194.
195.
196.       Serial.print(F("Sedikit = "));
197.       Serial.print(Sedikit->getPertinence());
198.       Serial.print(F(", Lumayan = "));
199.       Serial.print(Lumayan->getPertinence());
200.       Serial.print(F(", Penuh = "));
201.       Serial.println(Penuh->getPertinence());
202.
203.
204.    }
205.  }
206.
207.  int SensorJarak() {
208.    pinMode(Trig, OUTPUT);
209.    digitalWrite(Trig, LOW);
210.    delayMicroseconds(2);
211.
212.    digitalWrite(Trig, HIGH);
213.    delayMicroseconds(10);
214.    digitalWrite(Trig, LOW);
215.    pinMode(Echo, INPUT);
216.
217.    Durasi = pulseIn(Echo, HIGH);
218.    JarakCm = (Durasi / 2.9) / 2;
219.
220.    if (JarakCm >= 210) {
221.      JarakCm = dJarakCm;
222.    }
223.
224.    dJarakCm = JarakCm;
225.    return dJarakCm;
```

```
226.  }
227.
228.  float ScaleRange() {
229.    float berat = Scale.get_units(20);
230.    if (berat <= 0.1)
231.      berat = 0.0;
232.
233.    Scale.power_down();
234.    return berat;
235.  }
236.
237.  void TutupSampah(boolean Value, uint8_t Turun, uint8_t Naik,
uint8_t Tunggu) {
238.    if (Value == 1) {
239.      Tutup.write(Naik);
240.      delay(Tunggu);
241.    }
242.    else {
243.      Tutup.write(Turun);
244.    }
245.  }
246.
247.  void FuzzyInit() {
248.    FuzzyInput *Jarak = new FuzzyInput(1);
249.    Jarak->addFuzzySet(Tinggi);
250.    Jarak->addFuzzySet(Cukup);
251.    Jarak->addFuzzySet(Rendah);
252.    fuzzy->addFuzzyInput(Jarak);
253.
254.    //Fuzzy Beban
255.    FuzzyInput *Beban = new FuzzyInput(2);
256.    Beban->addFuzzySet(Ringan);
257.    Beban->addFuzzySet(Sedang);
258.    Beban->addFuzzySet(Berat);
259.    fuzzy->addFuzzyInput(Beban);
260.
261.    //Fuzzy Output
262.    FuzzyOutput *Hasil = new FuzzyOutput(1);
263.    Hasil->addFuzzySet(Sedikit);
264.    Hasil->addFuzzySet(Lumayan);
265.    Hasil->addFuzzySet(Penuh);
266.    fuzzy->addFuzzyOutput(Hasil);
267.
268.
269.
270.    //1 x y
271.    FuzzyRuleAntecedent        *RendahRingan          =          new
FuzzyRuleAntecedent();
272.    RendahRingan->joinWithAND(Rendah, Ringan);
273.    //
274.    FuzzyRuleConsequent *Hasil1 = new FuzzyRuleConsequent();
275.    Hasil1 ->addOutput(Sedikit);
276.    // sebutan e apa
277.    FuzzyRule   *fuzzyRule1   =   new   FuzzyRule(1,   RendahRingan,
Hasil1);
278.    fuzzy->addFuzzyRule(fuzzyRule1);
279.
280.    //2
281.    FuzzyRuleAntecedent *CukupRingan = new FuzzyRuleAntecedent();
282.    CukupRingan->joinWithAND(Cukup, Ringan);
283.
```

```
284.    FuzzyRuleConsequent *Hasil2 = new FuzzyRuleConsequent();
285.    Hasil2 ->addOutput(Sedikit);
286.
287.    FuzzyRule   *fuzzyRule2   =   new   FuzzyRule(2,   CukupRingan,
Hasil2);
288.    fuzzy->addFuzzyRule(fuzzyRule2);
289.
290.    //3
291.    FuzzyRuleAntecedent         *TinggiRingan         =         new
FuzzyRuleAntecedent();
292.    TinggiRingan->joinWithAND(Tinggi, Ringan);
293.
294.    FuzzyRuleConsequent *Hasil3 = new FuzzyRuleConsequent();
295.    Hasil3 ->addOutput(Penuh);
296.
297.    FuzzyRule   *fuzzyRule3   =   new   FuzzyRule(3,   TinggiRingan,
Hasil3);
298.    fuzzy->addFuzzyRule(fuzzyRule3);
299.
300.    //4
301.    FuzzyRuleAntecedent         *RendahSedang         =         new
FuzzyRuleAntecedent();
302.    RendahSedang->joinWithAND(Rendah, Sedang);
303.
304.    FuzzyRuleConsequent *Hasil4 = new FuzzyRuleConsequent();
305.    Hasil4 ->addOutput(Sedikit);
306.
307.    FuzzyRule   *fuzzyRule4   =   new   FuzzyRule(4,   RendahSedang,
Hasil4);
308.    fuzzy->addFuzzyRule(fuzzyRule4);
309.
310.    //5
311.    FuzzyRuleAntecedent *CukupSedang = new FuzzyRuleAntecedent();
312.    CukupSedang->joinWithAND(Cukup, Sedang);
313.
314.    FuzzyRuleConsequent *Hasil5 = new FuzzyRuleConsequent();
315.    Hasil5 ->addOutput(Lumayan);
316.
317.    FuzzyRule   *fuzzyRule5   =   new   FuzzyRule(5,   CukupSedang,
Hasil5);
318.    fuzzy->addFuzzyRule(fuzzyRule5);
319.
320.    //6
321.    FuzzyRuleAntecedent         *TinggiSedang         =         new
FuzzyRuleAntecedent();
322.    TinggiSedang->joinWithAND(Tinggi, Sedang);
323.
324.    FuzzyRuleConsequent *Hasil6 = new FuzzyRuleConsequent();
325.    Hasil6 ->addOutput(Penuh);
326.
327.    FuzzyRule   *fuzzyRule6   =   new   FuzzyRule(6,   TinggiSedang,
Hasil6);
328.    fuzzy->addFuzzyRule(fuzzyRule6);
329.
330.    //7
331.    FuzzyRuleAntecedent *RendahBerat = new FuzzyRuleAntecedent();
332.    RendahBerat->joinWithAND(Rendah, Berat);
333.
334.    FuzzyRuleConsequent *Hasil7 = new FuzzyRuleConsequent();
335.    Hasil7 ->addOutput(Lumayan);
336.
```

```
337.    FuzzyRule *fuzzyRule7 = new FuzzyRule(7, RendahBerat,
Hasil7);
338.    fuzzy->addFuzzyRule(fuzzyRule7);
339.
340.    //8
341.    FuzzyRuleAntecedent *CukupBerat = new FuzzyRuleAntecedent();
342.    CukupBerat->joinWithAND(Cukup, Berat);
343.
344.    FuzzyRuleConsequent *Hasil8 = new FuzzyRuleConsequent();
345.    Hasil8 ->addOutput(Penuh);
346.
347.    FuzzyRule *fuzzyRule8 = new FuzzyRule(8, CukupBerat, Hasil8);
348.    fuzzy->addFuzzyRule(fuzzyRule8);
349.
350.    //9
351.    FuzzyRuleAntecedent *TinggiBerat = new FuzzyRuleAntecedent();
352.    TinggiBerat->joinWithAND(Tinggi, Berat);
353.
354.    FuzzyRuleConsequent *Hasil9 = new FuzzyRuleConsequent();
355.    Hasil9 ->addOutput(Penuh);
356.
357.    FuzzyRule *fuzzyRule9 = new FuzzyRule(9, TinggiBerat,
Hasil9);
358.    fuzzy->addFuzzyRule(fuzzyRule9);
}
```

Report #14242655

3990975000 project report SMART TRASH CAN USING FUZZY LOGIC TJAN, DAVIN HARYANTO 17K10013 Faculty of Computer Science Soegijapranata Catholic University 2020 APPROVAL AND RATIFICATION PAGE Smart Trash Can Using Fuzzy Mamdani by TJAN, DAVIN HARYANTO – 17.K1.0013 This projec t report has been approved and ratified By the Faculty of Computer Science on January, DD. YYYY With approval, Supervisor Yonathan Purbo Santosa S.Kom., M.Sc. NPP: 05812007273 Examiners, 1.) [NAMA PENGUJI 1] NPP : 2.) [NAMA PENGUJI 2] NPP : 3.) [NAMA PENGUJI 3] NPP : Dean of Faculty of Computer Science Robertus Setiawan AJi Nugroho, Ph.D NPP: 058.1.2004.264 DECLARATION OF AUTHORSHIP I, the undersigned: Name: TJAN, DAVIN HARYANTO ID: 17.K1.0013 declare that this work, titled "Smart Trash Can Using Fuzzy Mamdani" , and the work presented in it is I confirm that: This work was done wholly or mainly while in candidature for a research