**ภาคผนวก ค**

โปรแกรมอะดุยโน ไอดีอี บอร์ดอีเอสพีโน 32

โปรแกรมอะดุยโน ไอดีอี บอร์ดอีเอสพีโน 32

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| |  |  | | --- | --- | | 1 | //----------------------------------------------------------------------------- | | 2 | // Project : RMUTR Digital Lock V1 | | 3 | // VSCode Extension : PlatformIO IDE 1.10.0 | | 4 | // Source : https://github.com/rmutr/Digital\_Lock\_V1\_Arduino.git | | 5 | // Board : Node32s (Gravitech Node32Lite LamLoei) | | 6 | // Additional URLs : https://dl.espressif.com/dl/package\_esp32\_index.json | | 7 | // LED\_BUILTIN : Pin 2 | | 8 | //----------------------------------------------------------------------------- | | 9 | #include <Arduino.h> | | 10 |  | | 11 | #include <ESP32Servo.h> | | 12 |  | | 13 | #include <SPI.h> | | 14 | #include <Wire.h> | | 15 | #include <Adafruit\_GFX.h> | | 16 | #include <Adafruit\_SSD1306.h> | | 17 |  | | 18 | #include <LiquidCrystal\_PCF8574.h> | | 19 |  | | 20 | #include <BLEDevice.h> | | 21 | #include <BLEServer.h> | | 22 | #include <BLEUtils.h> | | 23 | #include <BLE2902.h> | | 24 |  | | 25 | #define PIN\_RX\_0 3 | | 26 | #define PIN\_TX\_0 1 | | 27 |  | | 28 | #define I2C\_SCL 22 | | 29 | #define I2C\_SDA 21 | | 30 |  | | 31 | #define PIN\_PROCESS 2 | | 32 | #define PIN\_BTN\_START 32 | | 33 | #define PIN\_ALARM 12 | | 34 |  | | 35 | #define PNP\_OFF 0 | | 36 | #define PNP\_ON 1 | | 37 | #define NPN\_OFF 1 | | 38 | #define NPN\_ON 0 | | 39 |  | | 40 | #define EEPROM\_I2C\_ADDRESS 0x50 | | 41 | #define PIN\_RELAY\_A 26 | | 42 | #define PIN\_RELAY\_B 25 | | 43 | #define PIN\_RELAY\_C 27 | | 44 | #define PIN\_SERVO 14 | | 45 |  | | 46 | char buff\_str[200] = {0}; | | 47 | unsigned long t\_old = 0; | | 48 | int tmr\_cnt = 0; | | 49 | int wait\_100ms = 0; | | 50 | int alarm\_1sec = 0; | | 51 | int error = 0; | | 52 |  | | 53 | int state\_ix = 0; | | 54 | int state\_ix\_mon = 0; | | 55 |  | | 56 | int machine\_run = 0; | | 57 | volatile int machine\_stop\_start\_req = 0; | | 58 | int machine\_req\_wait\_100ms = 0; | | 59 |  | | 60 | int address = 0; | | 61 | Servo myservo; | | 62 | //----------------------------------------------------------------------------- | | 63 | #define SCREEN\_WIDTH 128 | | 64 | #define SCREEN\_HEIGHT 64 | | 65 | #define OLED\_RESET 4 | | 66 | #define GLCD\_LINE\_1 20 | | 67 |  | | 68 | Adafruit\_SSD1306 display(SCREEN\_WIDTH, SCREEN\_HEIGHT, &Wire, OLED\_RESET); | | 69 |  | | 70 | #define GLCD\_LINE\_0 5 | | 71 | #define GLCD\_LINE\_1 20 | | 72 | #define GLCD\_LINE\_2 35 | | 73 | #define GLCD\_LINE\_3 50 | | 74 |  | | 75 | //----------------------------------------------------------------------------- | | 76 | #define CLCD\_ADD\_27 0x27 | | 77 | #define CLCD\_ADD\_3F 0x3F | | 78 |  | | 79 | #define CLCD\_LINE\_0 0 | | 80 | #define CLCD\_LINE\_1 1 | | 81 |  | | 82 | LiquidCrystal\_PCF8574 clcd(CLCD\_ADD\_27); | | 83 |  | | 84 | //----------------------------------------------------------------------------- | | 85 | BLEServer \*pServer; | | 86 | BLECharacteristic \*pTxCharacteristic; | | 87 | volatile bool bt\_connected = false; | | 88 | volatile bool bt\_connected\_old = false; | | 89 | String bt\_pincode\_str = ""; | | 90 | std::string bt\_rxvalue\_str = ""; | | 91 | String bt\_rxdata\_str = ""; | | 92 | int bt\_login = 0; | | 93 | String msg\_connected\_str = ""; | | 94 | String msg\_pincode\_str = ""; | | 95 |  | | 96 | // See the following for generating UUIDs: | | 97 | // https://www.uuidgenerator.net/ | | 98 |  | | 99 | #define SERVICE\_UUID "6E400001-B5A3-F393-E0A9-E50E24DCCA9E" | | 100 | #define CHARACTERISTIC\_UUID\_RX "6E400002-B5A3-F393-E0A9-E50E24DCCA9E" | | 101 | #define CHARACTERISTIC\_UUID\_TX "6E400003-B5A3-F393-E0A9-E50E24DCCA9E" | | 102 |  | | 103 | //----------------------------------------------------------------------------- | | 104 | void Interrupt\_Service\_Btn\_Start(); | | 105 |  | | 106 | void Interrupt\_Service\_Btn\_Start() { machine\_stop\_start\_req = 1; } | | 107 |  | | 108 | class MyServerCallbacks: public BLEServerCallbacks { | | 109 | void onConnect(BLEServer\* pServer) { | | 110 | bt\_connected = true; | | 111 | }; | | 112 |  | | 113 | void onDisconnect(BLEServer\* pServer) { | | 114 | bt\_connected = false; | | 115 | } | | 116 | }; | | 117 |  | | 118 | class MyCallbacks: public BLECharacteristicCallbacks { | | 119 | void onWrite(BLECharacteristic \*pCharacteristic) { | | 120 | bt\_rxvalue\_str = pCharacteristic->getValue(); | | 121 | bt\_rxdata\_str = String(bt\_rxvalue\_str.c\_str()); | | 122 | } | | 123 | }; | | 124 |  | | 125 |  | | 126 | //----------------------------------------------------------------------------- | | 127 | void setup() { | | 128 | pinMode(PIN\_PROCESS, OUTPUT); | | 129 | pinMode(PIN\_BTN\_START, INPUT\_PULLUP); | | 130 | pinMode(PIN\_ALARM, OUTPUT); | | 131 | pinMode(PIN\_RELAY\_A, OUTPUT); | | 132 | pinMode(PIN\_RELAY\_B, OUTPUT); | | 133 | pinMode(PIN\_RELAY\_C, OUTPUT); | | 134 |  | | 135 | digitalWrite(PIN\_PROCESS, HIGH); | | 136 | digitalWrite(PIN\_BTN\_START, HIGH); | | 137 | digitalWrite(PIN\_ALARM, LOW); | | 138 | digitalWrite(PIN\_RELAY\_A, PNP\_OFF); | | 139 | digitalWrite(PIN\_RELAY\_B, PNP\_OFF); | | 140 | digitalWrite(PIN\_RELAY\_C, PNP\_OFF); | | 141 |  | | 142 | attachInterrupt(digitalPinToInterrupt(PIN\_BTN\_START) | | 143 | , Interrupt\_Service\_Btn\_Start, FALLING); | | 144 |  | | 145 | sprintf(buff\_str, "Digital Lock V1"); | | 146 |  | | 147 | Serial.begin(115200); | | 148 | Serial.println(buff\_str); | | 149 |  | | 150 | display.begin(SSD1306\_SWITCHCAPVCC, 0x3C); | | 151 | display.setTextSize(1); | | 152 | display.setTextColor(WHITE); | | 153 |  | | 154 | display.clearDisplay(); | | 155 | display.setCursor(0, GLCD\_LINE\_0); | | 156 | display.println(F(buff\_str)); | | 157 | display.display(); | | 158 |  | | 159 | clcd.begin(16, 2); | | 160 | clcd.init(); | | 161 | clcd.setBacklight(255); | | 162 | clcd.setCursor(0, CLCD\_LINE\_0); | | 163 | clcd.print(buff\_str); | | 164 |  | | 165 | //----------------------------------------------------------------------------- | | 166 | BLEDevice::init(buff\_str); | | 167 |  | | 168 | pServer = BLEDevice::createServer(); | | 169 | pServer->setCallbacks(new MyServerCallbacks()); | | 170 |  | | 171 | BLEService \*pService = pServer->createService(SERVICE\_UUID); | | 172 |  | | 173 | pTxCharacteristic = pService->createCharacteristic( | | 174 | CHARACTERISTIC\_UUID\_TX, | | 175 | BLECharacteristic::PROPERTY\_NOTIFY | | 176 | ); | | 177 |  | | 178 | pTxCharacteristic->addDescriptor(new BLE2902()); | | 179 |  | | 180 | BLECharacteristic \*pRxCharacteristic = pService->createCharacteristic( | | 181 | CHARACTERISTIC\_UUID\_RX, | | 182 | BLECharacteristic::PROPERTY\_WRITE | | 183 | ); | | 184 |  | | 185 | pRxCharacteristic->setCallbacks(new MyCallbacks()); | | 186 |  | | 187 | pService->start(); | | 188 |  | | 189 | pServer->getAdvertising()->start(); | | 190 | Serial.println("Waiting a client connection to notify..."); | | 191 |  | | 192 | //----------------------------------------------------------------------------- | | 193 | t\_old = 0; | | 194 | tmr\_cnt = 0; | | 195 | wait\_100ms = 0; | | 196 | alarm\_1sec = 0; | | 197 | error = 0; | | 198 | state\_ix = 0; | | 199 | state\_ix\_mon = 0; | | 200 | machine\_run = 0; | | 201 | machine\_stop\_start\_req = 0; | | 202 |  | | 203 | bt\_connected = false; | | 204 | bt\_connected\_old = false; | | 205 | //bt\_pincode\_str = "1234"; | | 206 | bt\_rxvalue\_str = ""; | | 207 | bt\_login = 0; | | 208 | msg\_connected\_str = ""; | | 209 | msg\_pincode\_str = ""; | | 210 |  | | 211 | //--------------------------------------------------------------------------- | | 212 | while(readEEPROM(EEPROM\_I2C\_ADDRESS, address) == 30) address += 5; | | 213 | for (int str=0; str < 4; str++) | | 214 | bt\_pincode\_str += readEEPROM(EEPROM\_I2C\_ADDRESS, (address+str+1)); | | 215 |  | | 216 | //----------------------------------------------------------------------------- | | 217 | ESP32PWM::allocateTimer(0); | | 218 | ESP32PWM::allocateTimer(1); | | 219 | ESP32PWM::allocateTimer(2); | | 220 | ESP32PWM::allocateTimer(3); | | 221 | myservo.setPeriodHertz(50); | | 222 | myservo.attach(PIN\_SERVO, 1000, 2000); | | 223 | myservo.write(10); //open130 close10 | | 224 |  | | 225 | Serial.print("-> code : "); | | 226 | Serial.println(bt\_pincode\_str); | | 227 | } | | 228 |  | | 229 | void loop() { | | 230 | //----------------------------------------------------------------------------- | | 231 | if (bt\_connected\_old != bt\_connected) { | | 232 | bt\_connected\_old = bt\_connected; | | 233 | if (bt\_connected == false) { | | 234 | msg\_connected\_str = "-> Bluetooth disconnected"; | | 235 | state\_ix = 0; | | 236 | } else { | | 237 | msg\_connected\_str = "-> Bluetooth connected"; | | 238 | } | | 239 | } | | 240 |  | | 241 | //----------------------------------------------------------------------------- | | 242 | if (machine\_stop\_start\_req == 1 && bt\_connected != 1) { | | 243 | if (machine\_req\_wait\_100ms == 0) { | | 244 | machine\_req\_wait\_100ms = 50; | | 245 | if(machine\_run == 1){ machine\_run = !machine\_run; } | | 246 | } | | 247 | } machine\_stop\_start\_req = 0; | | 248 |  | | 249 | //----------------------------------------------------------------------------- | | 250 | state\_ix\_mon = state\_ix; | | 251 |  | | 252 | switch (state\_ix) { | | 253 | default: | | 254 | case 0: | | 255 | bt\_login = 0; | | 256 | state\_ix++; | | 257 | break; | | 258 |  | | 259 | case 1: | | 260 | wait\_100ms = 5; //<- Give the bluetooth stack the chance to get things ready | | 261 | state\_ix++; | | 262 | break; | | 263 |  | | 264 | case 2: | | 265 | if (wait\_100ms == 0) { state\_ix++; } | | 266 | break; | | 267 |  | | 268 | case 3: | | 269 | pServer->startAdvertising(); //<- Restart advertising | | 270 | state\_ix++; | | 271 | break; | | 272 |  | | 273 | case 4: | | 274 | if (bt\_connected == true) { state\_ix++; } | | 275 | break; | | 276 |  | | 277 | case 5: | | 278 | if (bt\_rxdata\_str.length() > 0) { | | 279 | int bmsg\_ok = 0; | | 280 |  | | 281 | if (bt\_rxdata\_str.length() >= 7) { | | 282 | String bcmd\_str = bt\_rxdata\_str.substring(0, 3); | | 283 | String bpin\_str = bt\_rxdata\_str.substring(3, 7); | | 284 | int bcmd\_len = bt\_rxdata\_str.length(); | | 285 |  | | 286 | if (bt\_rxdata\_str == "Hi, ESP32") { | | 287 | bmsg\_ok = 1; | | 288 | msg\_pincode\_str = "-> Hi, Flutter"; | | 289 | } | | 290 |  | | 291 | if ((bcmd\_str == "C0-") && (bcmd\_len == 7) && (bpin\_str == bt\_pincode\_str)) { | | 292 | bmsg\_ok = 1; | | 293 | msg\_pincode\_str = "-> Command : Machine Stop"; | | 294 | bt\_login = 0; | | 295 | machine\_run = 0; | | 296 | } | | 297 |  | | 298 | if ((bcmd\_str == "C1-") && (bcmd\_len == 7) && (bpin\_str == bt\_pincode\_str)) { | | 299 | bmsg\_ok = 1; | | 300 | msg\_pincode\_str = "-> Command : Machine Start"; | | 301 | bt\_login = 1; | | 302 | machine\_run = 1; | | 303 | } | | 304 |  | | 305 | if ((bcmd\_str == "C2-") && (bcmd\_len == 7) && (bpin\_str == bt\_pincode\_str)) { | | 306 | bmsg\_ok = 1; | | 307 | msg\_pincode\_str = "-> Command : Login"; | | 308 | bt\_login = 1; | | 309 | } | | 310 |  | | 311 | if ((bcmd\_str == "C3-") && (bcmd\_len == 12) && (bpin\_str == bt\_pincode\_str)) { | | 312 | bmsg\_ok = 1; | | 313 | String bpin\_new\_str = bt\_rxdata\_str.substring(8, 12); | | 314 | bt\_pincode\_str = bpin\_new\_str; | | 315 | msg\_pincode\_str = "-> Command : Change Pincode to " + bpin\_new\_str; | | 316 | bt\_login = 0; | | 317 | //----------------------------------------------------------------------------- | | 318 | if(readEEPROM(EEPROM\_I2C\_ADDRESS, address) == 30) | | 319 | address += 5; | | 320 | if(readEEPROM(EEPROM\_I2C\_ADDRESS, address) < 30) | | 321 | writeEEPROM(EEPROM\_I2C\_ADDRESS, address, (readEEPROM  (EEPROM\_I2C\_ADDRESS, address)+1)); | | 322 | for (int str=0; str < 4; str++) | | 323 | writeEEPROM(EEPROM\_I2C\_ADDRESS, (address+str+1),  (bt\_pincode\_str.substring(str, (str+1)).toInt())); | | 324 | //----------------------------------------------------------------------------- | | 325 | } | | 326 |  | | 327 | if ((bcmd\_str == "C4-") && (bcmd\_len == 12) && (bpin\_str == bt\_pincode\_str)) { | | 328 | bmsg\_ok = 1; | | 329 | String balarm\_str = bt\_rxdata\_str.substring(8, 12); | | 330 | alarm\_1sec = balarm\_str.toInt(); | | 331 | if (alarm\_1sec < 0) { alarm\_1sec = 0; } | | 332 | if (alarm\_1sec > 9999) { alarm\_1sec = 9999; } | | 333 | balarm\_str = String(alarm\_1sec); | | 334 | msg\_pincode\_str = "-> Command : Machine Alarm " + balarm\_str + " Sec."; | | 335 | bt\_login = 1; | | 336 | } | | 337 |  | | 338 | if ((bcmd\_str == "C5-") && (bcmd\_len == 7) && (bpin\_str == bt\_pincode\_str)) { | | 339 | bmsg\_ok = 1; | | 340 | msg\_pincode\_str = "-> Command : Test interrupt stop start switch"; | | 341 | bt\_login = 1; | | 342 | machine\_stop\_start\_req = 1; | | 343 | } | | 344 | } | | 345 |  | | 346 | if (bmsg\_ok == 0) { | | 347 | msg\_pincode\_str = "-> Invalid message!!!"; | | 348 | } | | 349 |  | | 350 | bt\_rxdata\_str = ""; | | 351 | } | | 352 | break; | | 353 |  | | 354 | } | | 355 |  | | 356 | //----------------------------------------------------------------------------- | | 357 | if (machine\_run == 0) { | | 358 | digitalWrite(PIN\_RELAY\_A, PNP\_OFF); | | 359 | digitalWrite(PIN\_RELAY\_B, PNP\_OFF); | | 360 | myservo.write(10); //open130 close10 | | 361 | } else { | | 362 | digitalWrite(PIN\_RELAY\_A, PNP\_ON); | | 363 | digitalWrite(PIN\_RELAY\_B, PNP\_ON); | | 364 | myservo.write(130); //open130 close10 | | 365 | } | | 366 |  | | 367 | if (alarm\_1sec == 0) { | | 368 | digitalWrite(PIN\_ALARM, HIGH); | | 369 | } else { | | 370 | digitalWrite(PIN\_ALARM, LOW); | | 371 | } | | 372 |  | | 373 | //----------------------------------------------------------------------------- | | 374 | if (tmr\_cnt == 0) { | | 375 | bool bbusy = false; | | 376 |  | | 377 | sprintf(buff\_str, " St-%02d Sw-%02d Cnt-%d Li-%d Mc-%d A-%04d | " | | 378 | , state\_ix\_mon, machine\_req\_wait\_100ms, bt\_connected, bt\_login, machine\_run,  alarm\_1sec); | | 379 |  | | 380 | if ((bt\_connected == true) && (bt\_login == 1)) { | | 381 | char btxdata\_str[200] = {0}; | | 382 | sprintf(btxdata\_str, "Mc-%d A-%04d", machine\_run, alarm\_1sec); | | 383 | pTxCharacteristic->setValue(btxdata\_str); | | 384 | pTxCharacteristic->notify(); | | 385 | } | | 386 |  | | 387 | Serial.print(buff\_str); | | 388 |  | | 389 | display.clearDisplay(); | | 390 | display.setCursor(0, GLCD\_LINE\_1); | | 391 | display.println(F(buff\_str)); | | 392 | display.display(); | | 393 |  | | 394 | if ((bbusy == false) && (bt\_rxvalue\_str.length() > 0)) { | | 395 | bbusy = true; | | 396 | Serial.print("<- "); | | 397 | for (int i = 0; i < bt\_rxvalue\_str.length(); i++) { | | 398 | Serial.print(bt\_rxvalue\_str[i]); | | 399 | } | | 400 | bt\_rxvalue\_str = ""; | | 401 | } | | 402 |  | | 403 | if ((bbusy == false) && (msg\_connected\_str.length() > 0)) { | | 404 | bbusy = true; | | 405 | Serial.print(msg\_connected\_str); | | 406 | msg\_connected\_str = ""; | | 407 | } | | 408 |  | | 409 | if ((bbusy == false) && (msg\_pincode\_str.length() > 0)) { | | 410 | bbusy = true; | | 411 | Serial.print(msg\_pincode\_str); | | 412 | msg\_pincode\_str = ""; | | 413 | } | | 414 |  | | 415 | Serial.println(); | | 416 | } | | 417 |  | | 418 | //----------------------------------------------------------------------------- | | 419 | while ((micros() - t\_old) < 100000L); t\_old = micros(); | | 420 | tmr\_cnt++; if (tmr\_cnt >= 10) { tmr\_cnt = 0; } | | 421 |  | | 422 | if (wait\_100ms > 0) { wait\_100ms--; } | | 423 |  | | 424 | if (tmr\_cnt == 0) { | | 425 | if (alarm\_1sec > 0) { alarm\_1sec--; } | | 426 | } | | 427 |  | | 428 | if (machine\_req\_wait\_100ms > 0) { machine\_req\_wait\_100ms--; } | | 429 | } | | 430 |  | | 431 | //---------------------------------------------------------------------------- | | 432 | void writeEEPROM(int deviceaddress, unsigned int eeaddress, byte data ) | | 433 | { | | 434 | Wire.beginTransmission(deviceaddress); | | 435 | Wire.write((int)(eeaddress >> 8)); // MSB | | 436 | Wire.write((int)(eeaddress & 0xFF)); // LSB | | 437 | Wire.write(data); | | 438 | Wire.endTransmission(); | | 439 | delay(5); | | 440 | } | | 441 |  | | 442 | byte readEEPROM(int deviceaddress, unsigned int eeaddress ) | | 443 | { | | 444 | byte rdata = 0xFF; | | 445 |  | | 446 | Wire.beginTransmission(deviceaddress); | | 447 | Wire.write((int)(eeaddress >> 8)); // MSB | | 448 | Wire.write((int)(eeaddress & 0xFF)); // LSB | | 449 | Wire.endTransmission(); | | 450 | Wire.requestFrom(deviceaddress,1); | | 451 |  | | 452 | if (Wire.available()) rdata = Wire.read(); | | 453 | return rdata; | | 454 | } | |  | | | |  |  |  |  |
|  |  |  |  |  |  |  |  |  |