

## Vitezometru si Odometru pentru bicicleta, cu recorder pentru 99 de lap-uri.

### Introducere

Prezentarea pe scurt a proiectului vostru:

- Vitezometru si Odometru, bazat pe o placa de baza Arduino Uno
- monitorizarea vitezei si a performantei pe durata a 99 de ture
- nevoia unei cunostinte de a avea un vitezometru
- elimina nevoia de a purta un telefon in buzunar pentru a monitoriza performantele ce pot fi eventual eronate

### Descriere generală

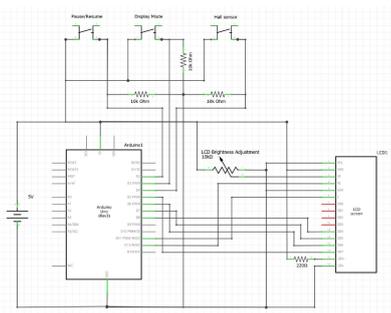
O schemă bloc cu toate modulele proiectului vostru, atât software cât și hardware însoțită de o descriere a acestora precum și a modului în care interacționează.

Exemplu de schemă bloc: <http://www.robs-projects.com/mp3proj/newplayer.html>

### Hardware Design

Aici puneți tot ce ține de hardware design:

- Arduino Uno - 1
- Hall Effect Sensor - 1
- Push Buttons - 2
- 16x2 LCD Display - 1
- 10kΩ Potentiometer - 1
- 10kΩ Resistor - 2



### Software Design

- Arduino IDE
- Additional Libraries: Wire/EEPROM/RTCLib/LiquidCrystal

```
#include <LiquidCrystal.h>
```

```
LiquidCrystal lcd(12, 11, 8, 7, 6, 5);

float bicycleWheelCircumference = 2.1206;

const int pauseButton = 2;
boolean lastPauseButton = LOW;
boolean currentPauseButton = LOW;

const int displayModeButton = 3;
boolean lastDisplayModeButton = LOW;
boolean currentDisplayModeButton = LOW;

const int revolutionButton = 4;
boolean lastRevolutionButton = LOW;
boolean currentRevolutionButton = LOW;

boolean startShown = HIGH;

boolean paused = LOW;
boolean pausedShown = LOW;
unsigned long pausedStartTime = 0;

boolean wheelTurningShown = LOW;
unsigned long wheelTurningStartTime = 0;

boolean cycleSafelyShown = LOW;
unsigned long cycleSafelyStartTime = 0;

unsigned long lastRevolutionStartTime = 0;
unsigned long revolutionTime = 0;

int currentDisplayMode = 0;
int showLap = 0;
int lapCurrentlyShown = 100;
int currentLap = 0;

float currentDistance;
unsigned long currentDuration;
int currentMaximumKPH;
int currentAverageKPH;
int currentKPH;

float arrayDistance[100];
unsigned long arrayDuration[100];
int arrayMaximumKPH[100];
int arrayAverageKPH[100];

unsigned long revolutionCount = 0;
unsigned long currentTime = 0;
unsigned long lapStartTime = 0;
```

```
float km = 0.00;
float kph = 0.00;
int intHours;
int intMinutes;
int intSeconds;

unsigned long milliSecondsInSecond = 1000;
unsigned long milliSecondsInMinute = 60000;
unsigned long milliSecondsInHour = 3600000;

void setup()
{

  pinMode (revolutionButton, INPUT);
  pinMode (pauseButton, INPUT);
  pinMode (displayModeButton, INPUT);

  arrayMaximumKPH[0] = 0;

  lcd.begin(16, 2);
  lcd.clear();
  lcd.setCursor(2, 0);
  lcd.print("PRESS BUTTON");
  lcd.setCursor(4, 1);
  lcd.print("TO START");

}

void loop() {

  currentTime = millis();

  currentRevolutionButton = debounce(lastRevolutionButton,
revolutionButton);
  if (lastRevolutionButton == HIGH && currentRevolutionButton == LOW) {

    if (!startShown && !paused) {

      revolutionCount++;

      lcd.setCursor(0, 0);
      lcd.print("+");
      wheelTurningShown = HIGH;
      wheelTurningStartTime = currentTime;

      if (lastRevolutionStartTime > 0) {

        revolutionTime = currentTime - lastRevolutionStartTime;

        kph = (3600000 / revolutionTime) * bicycleWheelCircumference / 1000;
```

```
    currentKPH = kph;

    if (currentMaximumKPH < currentKPH) {
        currentMaximumKPH = currentKPH;
    }
}
lastRevolutionStartTime = currentTime;
}
}
lastRevolutionButton = currentRevolutionButton;

currentPauseButton = debounce(lastPauseButton, pauseButton);
if (lastPauseButton == LOW && currentPauseButton == HIGH) {

    if (startShown) {

        startShown = LOW;

        showCycleSafely();
        cycleSafelyShown = HIGH;
        cycleSafelyStartTime = currentTime;

        currentLap = 1;
        resetLapVariables();
        currentDisplayMode = 1;

    }
    else {

        if (paused) {

            paused = LOW;

            showCycleSafely();
            cycleSafelyShown = HIGH;
            cycleSafelyStartTime = currentTime;

            currentLap++;

            if (currentLap > 99) {
                currentLap = 99;
                lapCurrentlyShown = 100;
            }

            resetLapVariables();
            currentDisplayMode = 1;
        }

        else {

            paused = HIGH;
```

```
currentDuration = currentTime - lapStartTime;

if (currentDuration < 2000) {
    currentLap--;
}
else {

    if (revolutionCount > 0) {
        currentDistance = revolutionCount * bicycleWheelCircumference /
1000;
        currentAverageKPH = currentDistance * 3600000 / currentDuration;
    }

    arrayDistance[currentLap] = currentDistance;
    arrayDuration[currentLap] = currentDuration;
    arrayAverageKPH[currentLap] = currentAverageKPH;
    arrayMaximumKPH[currentLap] = currentMaximumKPH;

    arrayDistance[0] = arrayDistance[0] + currentDistance;
    arrayDuration[0] = arrayDuration[0] + currentDuration;
    arrayAverageKPH[0] = arrayDistance[0] * 3600000 /
arrayDuration[0];
    if (currentMaximumKPH > arrayMaximumKPH[0]) {
        arrayMaximumKPH[0] = currentMaximumKPH;
    }
}

cycleSafelyShown = LOW;

showPaused();
pausedShown = HIGH;
pausedStartTime = currentTime;

showLap = currentLap;
currentDisplayMode = 3;

lapCurrentlyShown = 100;
}
}
}
lastPauseButton = currentPauseButton;

currentDisplayModeButton = debounce(lastDisplayModeButton,
displayModeButton);
if (lastDisplayModeButton == LOW && currentDisplayModeButton == HIGH) {

    if (startShown) {

        startShown = LOW;
```

```
    showCycleSafely();
    cycleSafelyShown = HIGH;
    cycleSafelyStartTime = currentTime;

    currentLap = 1;
    resetLapVariables();
    currentDisplayMode = 1;
}
else {

    if (!cycleSafelyShown && !pausedShown) {

        if (!paused) {

            if (currentDisplayMode == 1) {
                currentDisplayMode = 2;
            }
            else {
                currentDisplayMode = 1;
            }

            showLabels(currentDisplayMode);
        }

        else {
            currentDisplayMode = 3;
            showLap++;
            if (showLap > currentLap) {
                showLap = 0; // Show totals
            }
        }
    }
}

lastDisplayModeButton = currentDisplayModeButton;

if (wheelTurningShown && !startShown && !paused && (currentTime >=
(wheelTurningStartTime + 250))) {
    wheelTurningShown = LOW;
    lcd.setCursor(0, 0);
    lcd.print(" ");
}

if (!startShown && !paused && (currentTime >= (lastRevolutionStartTime +
10000)) && currentKPH > 0) {
    currentKPH = 0;
}

if (cycleSafelyShown && (currentTime >= (cycleSafelyStartTime + 2000))) {
    cycleSafelyShown = LOW;
}
```

```
    showLabels(currentDisplayMode);
}

if (pausedShown && (currentTime >= (pausedStartTime + 2000))) {
    pausedShown = LOW;
    showLabels(currentDisplayMode);
}

if (!startShown && !paused) {

    currentDuration = currentTime - lapStartTime;

    if (revolutionCount > 0) {
        currentDistance = revolutionCount * bicycleWheelCircumference / 1000;

        currentAverageKPH = currentDistance * 3600000 / currentDuration;
    }
}

if (!startShown && !cycleSafelyShown && !pausedShown) {

    if (currentDisplayMode < 3) {

        lcd.setCursor(1, 0);
        lcd.print(currentDistance);
        lcd.print(" km");

        lcd.setCursor(14, 0);
        if (currentKPH < 10) {
            lcd.print(" ");
        }
        lcd.print(currentKPH);

        computeHMS(currentDuration);
        lcd.setCursor(1, 1);
        if (intHours < 10) {
            lcd.print("0");
        }
        lcd.print(intHours);

        lcd.print(":");
        if (intMinutes < 10) {
            lcd.print("0");
        }
        lcd.print(intMinutes);

        lcd.print(":");
        if (intSeconds < 10) {
            lcd.print("0");
        }
        lcd.print(intSeconds);
    }
}
```

```
lcd.setCursor(12, 1);
lcd.print("A");

if (currentDisplayMode == 1) {
  lcd.setCursor(12, 1);
  lcd.print("A");
  lcd.setCursor(14, 1);
  if (currentAverageKPH < 10) {
    lcd.print(" ");
  }
  lcd.print(currentAverageKPH);
}
else {
  lcd.setCursor(12, 1);
  lcd.print("M");
  lcd.setCursor(14, 1);
  if (currentMaximumKPH < 10) {
    lcd.print(" ");
  }
  lcd.print(currentMaximumKPH);
}
}

else {

  if (lapCurrentlyShown != showLap) {

    lapCurrentlyShown = showLap;

    lcd.clear();

    lcd.setCursor(0, 0);
    if (showLap == 0) {
      lcd.print("T ");
    }
    else {
      lcd.print(showLap);
    }

    lcd.setCursor(3, 0);
    lcd.print("Avg");
    lcd.setCursor(7, 0);
    lcd.print(arrayAverageKPH[showLap]);
    if (arrayAverageKPH[showLap] < 10) {
      lcd.print(" ");
    }

    lcd.setCursor(10, 0);
    lcd.print("Max");
    lcd.setCursor(14, 0);
```

```
    lcd.print(arrayMaximumKPH[showLap]);
    if (arrayMaximumKPH[showLap] < 10) {
        lcd.print(" ");
    }

    lcd.setCursor(0, 1);
    lcd.print("      ");
    lcd.setCursor(0, 1);
    lcd.print(arrayDistance[showLap]);

    computeHMS(arrayDuration[showLap]);
    lcd.setCursor(8, 1);
    if (intHours < 10) {
        lcd.print("0");
    }
    lcd.print(intHours);

    lcd.print(":");

    if (intMinutes < 10) {
        lcd.print("0");
    }
    lcd.print(intMinutes);

    lcd.print(":");

    if (intSeconds < 10) {
        lcd.print("0");
    }
    lcd.print(intSeconds);
}
}
}

void computeHMS(unsigned long duration) {

    float floatHours;
    float floatMinutes;
    float floatSeconds;

    intHours = 0;
    intMinutes = 0;
    intSeconds = 0;

    if (duration >= 1000) {
        floatSeconds = duration / milliSecondsInSeconds % 60;
        intSeconds = floatSeconds;

        floatMinutes = duration / milliSecondsInMinute % 60;
        intMinutes = floatMinutes;
```

```
        floatHours = duration / milliSecondsInHour % 24;
        intHours = floatHours;
    }
}

void resetLapVariables() {
    revolutionCount = 0;

    lapStartTime = currentTime;

    currentDistance = 0;
    currentDuration = 0;
    currentMaximumKPH = 0;
    currentAverageKPH = 0;
}

void showCycleSafely() {
    lcd.clear();
    lcd.setCursor(5, 0);
    lcd.print("CYCLE");
    lcd.setCursor(4, 1);
    lcd.print("SAFELY!");
}

void showPaused() {
    lcd.clear();
    lcd.setCursor(4, 0);
    lcd.print("PAUSED!");
}

void showLabels(int currentDisplayMode) {

    lcd.clear();
    switch (currentDisplayMode)    {
    case 1:
        lcd.setCursor(12, 0);
        lcd.print("S");
        lcd.setCursor(12, 1);
        lcd.print("A");
        break;
    case 2:
        lcd.setCursor(12, 0);
        lcd.print("S");
        lcd.setCursor(12, 1);
        lcd.print("M");
        break;
    }
}

boolean debounce(boolean last, int pin)
```

```
{
  boolean current = digitalRead(pin);
  if (last != current) {
    delay(5);
    current = digitalRead(pin);
  }
  return current;
}
```

## Rezultate Obținute

Care au fost rezultatele obținute în urma realizării proiectului vostru.

Concluzii

Download

O arhivă (sau mai multe dacă este cazul) cu fișierele obținute în urma realizării proiectului: surse, scheme, etc. Un fișier README, un ChangeLog, un script de compilare și copiere automată pe uC crează întotdeauna o impresie bună .

Fișierele se încarcă pe wiki folosind facilitatea **Add Images or other files**. Namespace-ul în care se încarcă fișierele este de tipul **:pm:prj20??:c?** sau **:pm:prj20??:c?:nume\_student** (dacă este cazul).

**Exemplu:** Dumitru Alin, 331CC → **:pm:prj2009:cc:dumitru\_alin**.

Jurnal

Puteți avea și o secțiune de jurnal în care să poată urmări asistentul de proiect progresul proiectului.

Bibliografie/Resurse

- [WIRE Library](#)
- [EEPROM Library](#)
- [RTC Library](#)
- [Liquid Crystal](#)

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