DATA LR5 Лабораторна робота 5

Код програми

#include <Wire.h> // подключение библиотеки Wire

int ADXL345 = 0x53; // Адрес I2C датчика ADXL345

int roll,pitch;

float X\_out, Y\_out, Z\_out; // Выходы

void setup() {

 Serial.begin(9600);

 Wire.begin(); // Инициализация библиотеки Wire

 // Установите ADXL345 в режим измерения

 Wire.beginTransmission(ADXL345); // Начать общение с устройством

 Wire.write(0x2D); // работа с регистром POWER\_CTL - 0x2D

 // Включить измерение

 Wire.write(8); // (8dec -> 0000 1000 двоичный) Бит D3 High для разрешения измерения

 Wire.endTransmission();

 delay(10);

}

void loop() {

// === Считать данные акселерометра === //

 Wire.beginTransmission(ADXL345);

 Wire.write(0x32); // Начать с регистра 0x32 (ACCEL\_XOUT\_H)

 Wire.endTransmission(false);

 Wire.requestFrom(ADXL345, 6, true); // Чтение всех 6 регистров, значение каждой оси сохраняется в 2 регистрах

 X\_out = ( Wire.read()| Wire.read() << 8); // Значение по оси X

 X\_out = X\_out/256; //Для диапазона + -2g нам нужно разделить необработанные огрррррррррррнгорррррррррзначения на 256 в соответствии с datasheet

 Y\_out = ( Wire.read()| Wire.read() << 8); // Значение по оси Y

 Y\_out = Y\_out/256;

 Z\_out = ( Wire.read()| Wire.read() << 8); // Значение по оси Z

 Z\_out = Z\_out/256;

 Serial.print("Xa= ");

 Serial.print(X\_out);

 Serial.print(" Ya= ");

 Serial.print(Y\_out);

 Serial.print(" Za= ");

 Serial.println(Z\_out);

 //Расчет крена и тангажа (вращение вокруг оси X, вращение вокруг оси Y)

roll = atan(Y\_out / sqrt(pow(X\_out, 2) + pow(Z\_out, 2))) \* 180 / PI;

pitch = atan(-1 \* X\_out / sqrt(pow(Y\_out, 2) + pow(Z\_out, 2))) \* 180 / PI;

Serial.print(" roll= ");

 Serial.print(roll);

 Serial.print(" pitch = ");

 Serial.println(pitch);

}

**Дані для повільного руху**



**15:55:38.700 -> Xa= -0.94 Ya= -0.08 Za= -0.04**

**15:55:38.700 -> roll= -4 pitch = 84**

**15:55:38.747 -> Xa= -0.94 Ya= -0.08 Za= -0.04**

**15:55:38.747 -> roll= -4 pitch = 84**

**15:55:38.793 -> Xa= -1.04 Ya= -0.09 Za= -0.06**

**15:55:38.841 -> roll= -4 pitch = 84**

**15:55:38.841 -> Xa= -1.02 Ya= -0.07 Za= -0.05**

**15:55:38.889 -> roll= -3 pitch = 85**

**15:55:38.889 -> Xa= -0.97 Ya= -0.11 Za= -0.04**

**15:55:38.935 -> roll= -6 pitch = 82**

**15:55:38.935 -> Xa= -1.00 Ya= -0.07 Za= -0.05**

**15:55:38.980 -> roll= -4 pitch = 84**

**15:55:39.026 -> Xa= -1.01 Ya= -0.09 Za= -0.06**

**15:55:39.026 -> roll= -4 pitch = 84**

**15:55:39.072 -> Xa= -1.02 Ya= -0.07 Za= -0.04**

**15:55:39.118 -> roll= -4 pitch = 85**

**15:55:39.118 -> Xa= -1.05 Ya= -0.05 Za= -0.03**

**15:55:39.164 -> roll= -2 pitch = 86**

**15:55:39.164 -> Xa= -1.05 Ya= -0.12 Za= -0.06**

**15:55:39.211 -> roll= -6 pitch = 82**

**15:55:39.257 -> Xa= -0.92 Ya= -0.17 Za= -0.03**

**15:55:39.257 -> roll= -10 pitch = 79**

**15:55:39.304 -> Xa= -1.06 Ya= -0.07 Za= -0.04**

**15:55:39.304 -> roll= -3 pitch = 85**

**15:55:39.350 -> Xa= -0.97 Ya= -0.11 Za= -0.03**

**15:55:39.396 -> roll= -6 pitch = 83**

**15:55:39.396 -> Xa= -1.01 Ya= -0.14 Za= -0.05**

**15:55:39.443 -> roll= -8 pitch = 81**

**15:55:39.443 -> Xa= -0.93 Ya= -0.11 Za= 0.00**

**15:55:39.489 -> roll= -6 pitch = 83**

**15:55:39.489 -> Xa= -1.16 Ya= -0.11 Za= -0.04**

**15:55:39.537 -> roll= -5 pitch = 84**

**15:55:39.584 -> Xa= -0.96 Ya= -0.04 Za= 0.04**

**15:55:39.584 -> roll= -2 pitch = 86**

**15:55:39.630 -> Xa= -1.16 Ya= -0.05 Za= 0.03**

**15:55:39.630 -> roll= -2 pitch = 87**

**15:55:39.676 -> Xa= -0.80 Ya= -0.10 Za= 0.10**

**15:55:39.723 -> roll= -6 pitch = 80**

**15:55:39.723 -> Xa= -1.20 Ya= -0.01 Za= 0.09**

**15:55:39.769 -> roll= 0 pitch = 85**

**15:55:39.769 -> Xa= -0.98 Ya= -0.09 Za= 0.10**

**15:55:39.815 -> roll= -5 pitch = 82**

**15:55:39.815 -> Xa= -1.12 Ya= -0.08 Za= 0.08**

**15:55:39.862 -> roll= -4 pitch = 84**

**15:55:39.909 -> Xa= -1.01 Ya= -0.08 Za= 0.11**

**15:55:39.909 -> roll= -4 pitch = 82**

**15:55:39.955 -> Xa= -1.01 Ya= -0.12 Za= 0.08**

**15:55:39.955 -> roll= -6 pitch = 82**

**15:55:40.002 -> Xa= -1.09 Ya= -0.07 Za= 0.08**

**15:55:40.050 -> roll= -3 pitch = 84**

**15:55:40.050 -> Xa= -0.95 Ya= -0.02 Za= 0.13**

**15:55:40.096 -> roll= 0 pitch = 82**

**15:55:40.096 -> Xa= -1.17 Ya= -0.04 Za= 0.10**

**15:55:40.143 -> roll= -1 pitch = 84**

**15:55:40.143 -> Xa= -1.00 Ya= -0.03 Za= 0.12**

**15:55:40.190 -> roll= -1 pitch = 83**

**15:55:40.236 -> Xa= -1.13 Ya= -0.01 Za= 0.09**

**15:55:40.236 -> roll= 0 pitch = 85**

**15:55:40.284 -> Xa= -1.00 Ya= -0.06 Za= 0.11**

**15:55:40.284 -> roll= -3 pitch = 83**

**15:55:40.330 -> Xa= -1.03 Ya= -0.03 Za= 0.11**

**15:55:40.330 -> roll= -1 pitch = 83**

**15:55:40.377 -> Xa= -1.02 Ya= -0.01 Za= 0.10**

**15:55:40.423 -> roll= 0 pitch = 84**

**15:55:40.423 -> Xa= -1.04 Ya= -0.00 Za= 0.12**

**15:55:40.469 -> roll= 0 pitch = 83**

**15:55:40.469 -> Xa= -1.04 Ya= 0.00 Za= 0.12**

**15:55:40.514 -> roll= 0 pitch = 83**

**15:55:40.514 -> Xa= -1.10 Ya= 0.01 Za= 0.10**

**15:55:40.561 -> roll= 0 pitch = 84**

**15:55:40.561 -> Xa= -1.02 Ya= -0.02 Za= 0.11**

**15:55:40.607 -> roll= -1 pitch = 83**

**15:55:40.653 -> Xa= -1.02 Ya= -0.01 Za= 0.10**

**15:55:40.653 -> roll= 0 pitch = 84**

**Дані для швидкого руху**



**15:57:35.757 -> Xa= -0.55 Ya= -0.25 Za= -0.38**

**15:57:35.757 -> roll= -20 pitch = 50**

**15:57:35.805 -> Xa= -0.88 Ya= -0.04 Za= -0.43**

**15:57:35.851 -> roll= -2 pitch = 63**

**15:57:35.851 -> Xa= -0.71 Ya= -0.23 Za= -0.41**

**15:57:35.899 -> roll= -15 pitch = 56**

**15:57:35.899 -> Xa= -0.76 Ya= -0.12 Za= -0.40**

**15:57:35.945 -> roll= -7 pitch = 61**

**15:57:35.945 -> Xa= -0.84 Ya= -0.12 Za= -0.39**

**15:57:35.990 -> roll= -7 pitch = 63**

**15:57:36.036 -> Xa= -0.80 Ya= -0.27 Za= -0.49**

**15:57:36.036 -> roll= -16 pitch = 54**

**15:57:36.082 -> Xa= -0.72 Ya= -0.13 Za= -0.34**

**15:57:36.129 -> roll= -9 pitch = 63**

**15:57:36.129 -> Xa= -0.63 Ya= -0.41 Za= -0.44**

**15:57:36.175 -> roll= -27 pitch = 46**

**15:57:36.175 -> Xa= -2.00 Ya= -1.15 Za= -1.64**

**15:57:36.221 -> roll= -23 pitch = 44**

**15:57:36.268 -> Xa= -0.14 Ya= 1.79 Za= 0.71**

**15:57:36.268 -> roll= 67 pitch = 4**

**15:57:36.315 -> Xa= 1.98 Ya= -0.86 Za= -0.55**

**15:57:36.315 -> roll= -22 pitch = -62**

**15:57:36.362 -> Xa= -2.00 Ya= -1.82 Za= -2.00**

**15:57:36.409 -> roll= -32 pitch = 36**

**15:57:36.409 -> Xa= 1.62 Ya= 0.89 Za= 1.06**

**15:57:36.456 -> roll= 24 pitch = -49**

**15:57:36.456 -> Xa= -0.55 Ya= -1.55 Za= -2.00**

**15:57:36.503 -> roll= -36 pitch = 12**

**15:57:36.503 -> Xa= -0.68 Ya= 1.39 Za= -2.00**

**15:57:36.550 -> roll= 33 pitch = 15**

**15:57:36.550 -> Xa= 0.13 Ya= -0.08 Za= 0.56**

**15:57:36.596 -> roll= -7 pitch = -12**

**15:57:36.643 -> Xa= 0.03 Ya= -1.77 Za= -2.00**

**15:57:36.643 -> roll= -41 pitch = 0**

**15:57:36.690 -> Xa= -0.33 Ya= 1.03 Za= -0.80**

**15:57:36.690 -> roll= 49 pitch = 14**

**15:57:36.737 -> Xa= -2.00 Ya= 0.98 Za= -0.40**

**15:57:36.783 -> roll= 25 pitch = 62**

**15:57:36.783 -> Xa= 2.00 Ya= -0.64 Za= 0.21**

**15:57:36.830 -> roll= -17 pitch = -71**

**15:57:36.830 -> Xa= -0.96 Ya= -1.48 Za= -2.00**

**15:57:36.877 -> roll= -33 pitch = 21**

**15:57:36.922 -> Xa= -2.00 Ya= 1.80 Za= -0.73**

**15:57:36.922 -> roll= 40 pitch = 45**

**15:57:36.969 -> Xa= 0.52 Ya= -0.23 Za= 0.50**

**15:57:36.969 -> roll= -17 pitch = -43**

**15:57:37.016 -> Xa= -0.47 Ya= -1.65 Za= -2.00**

**15:57:37.063 -> roll= -38 pitch = 10**

**15:57:37.063 -> Xa= -0.29 Ya= 0.00 Za= -1.52**

**15:57:37.109 -> roll= 0 pitch = 10**

**15:57:37.109 -> Xa= -2.00 Ya= 2.00 Za= -0.38**

**15:57:37.156 -> roll= 44 pitch = 44**

**15:57:37.156 -> Xa= 2.00 Ya= -1.09 Za= 0.31**

**15:57:37.202 -> roll= -28 pitch = -60**

**15:57:37.249 -> Xa= -1.08 Ya= -1.88 Za= -2.00**

**15:57:37.249 -> roll= -39 pitch = 21**

**15:57:37.296 -> Xa= -2.00 Ya= 2.00 Za= -0.73**

**15:57:37.296 -> roll= 43 pitch = 43**

**15:57:37.342 -> Xa= -0.32 Ya= -0.20 Za= 0.07**

**15:57:37.389 -> roll= -30 pitch = 56**

**15:57:37.389 -> Xa= 1.15 Ya= -1.93 Za= -2.00**

**15:57:37.436 -> roll= -39 pitch = -22**

**15:57:37.436 -> Xa= -0.95 Ya= 1.01 Za= -1.36**

**15:57:37.483 -> roll= 31 pitch = 29**

**15:57:37.530 -> Xa= -2.00 Ya= 2.00 Za= -0.02**

**15:57:37.530 -> roll= 44 pitch = 45**

**Дані для поступального руху**



**15:59:06.371 -> Xa= 0.38 Ya= -0.95 Za= -0.11**

**15:59:06.419 -> roll= -67 pitch = -21**

**15:59:06.419 -> Xa= 0.39 Ya= -0.88 Za= -0.12**

**15:59:06.465 -> roll= -65 pitch = -23**

**15:59:06.513 -> Xa= 0.36 Ya= -0.88 Za= -0.10**

**15:59:06.513 -> roll= -66 pitch = -22**

**15:59:06.560 -> Xa= 0.34 Ya= -0.85 Za= -0.10**

**15:59:06.560 -> roll= -67 pitch = -21**

**15:59:06.606 -> Xa= 0.36 Ya= -0.98 Za= -0.13**

**15:59:06.653 -> roll= -68 pitch = -19**

**15:59:06.653 -> Xa= 0.38 Ya= -0.75 Za= -0.11**

**15:59:06.699 -> roll= -61 pitch = -26**

**15:59:06.699 -> Xa= 0.40 Ya= -0.97 Za= -0.13**

**15:59:06.746 -> roll= -66 pitch = -22**

**15:59:06.793 -> Xa= 0.34 Ya= -0.93 Za= -0.18**

**15:59:06.793 -> roll= -67 pitch = -19**

**15:59:06.840 -> Xa= 0.29 Ya= -0.91 Za= -0.13**

**15:59:06.840 -> roll= -70 pitch = -17**

**15:59:06.887 -> Xa= 0.37 Ya= -0.91 Za= -0.16**

**15:59:06.934 -> roll= -65 pitch = -22**

**15:59:06.934 -> Xa= 0.27 Ya= -0.92 Za= -0.11**

**15:59:06.979 -> roll= -72 pitch = -16**

**15:59:06.979 -> Xa= 0.30 Ya= -0.89 Za= -0.10**

**15:59:07.027 -> roll= -70 pitch = -18**

**15:59:07.073 -> Xa= 0.30 Ya= -0.93 Za= -0.07**

**15:59:07.073 -> roll= -71 pitch = -18**

**15:59:07.119 -> Xa= 0.23 Ya= -0.91 Za= -0.04**

**15:59:07.164 -> roll= -75 pitch = -14**

**15:59:07.164 -> Xa= 0.29 Ya= -0.95 Za= -0.11**

**15:59:07.211 -> roll= -72 pitch = -16**

**15:59:07.211 -> Xa= 0.25 Ya= -0.96 Za= -0.03**

**15:59:07.258 -> roll= -75 pitch = -14**

**15:59:07.258 -> Xa= 0.30 Ya= -0.91 Za= -0.06**

**15:59:07.304 -> roll= -71 pitch = -17**

**15:59:07.351 -> Xa= 0.28 Ya= -0.92 Za= -0.02**

**15:59:07.351 -> roll= -72 pitch = -17**

**15:59:07.397 -> Xa= 0.12 Ya= -0.92 Za= 0.01**

**15:59:07.444 -> roll= -82 pitch = -7**

**15:59:07.444 -> Xa= 0.21 Ya= -0.90 Za= -0.05**

**15:59:07.491 -> roll= -76 pitch = -13**

**15:59:07.491 -> Xa= 0.21 Ya= -0.96 Za= -0.03**

**15:59:07.539 -> roll= -77 pitch = -12**

**15:59:07.539 -> Xa= 0.01 Ya= -1.02 Za= 0.02**

**15:59:07.585 -> roll= -88 pitch = 0**

**15:59:07.633 -> Xa= 0.12 Ya= -1.00 Za= -0.00**

**15:59:07.633 -> roll= -82 pitch = -7**

**15:59:07.680 -> Xa= 0.13 Ya= -1.00 Za= -0.04**

**15:59:07.680 -> roll= -82 pitch = -7**

**15:59:07.727 -> Xa= 0.16 Ya= -0.95 Za= -0.00**

**15:59:07.775 -> roll= -80 pitch = -9** **15:59:07.775 -> Xa= 0.07 Ya= -0.99 Za= 0.00**

**15:59:07.821 -> roll= -85 pitch = -4**

**15:59:07.821 -> Xa= 0.05 Ya= -1.05 Za= -0.02**

**15:59:07.868 -> roll= -87 pitch = -2**

**15:59:07.868 -> Xa= 0.07 Ya= -1.00 Za= 0.02**

**15:59:07.915 -> roll= -85 pitch = -4**

**15:59:07.962 -> Xa= 0.08 Ya= -0.97 Za= 0.00**

**15:59:07.962 -> roll= -85 pitch = -4**

**15:59:08.008 -> Xa= 0.06 Ya= -0.99 Za= 0.00**

**15:59:08.008 -> roll= -86 pitch = -3**

**15:59:08.054 -> Xa= 0.12 Ya= -1.00 Za= -0.02**

**15:59:08.101 -> roll= -83 pitch = -6**

**15:59:08.101 -> Xa= 0.07 Ya= -0.96 Za= 0.02**

**15:59:08.148 -> roll= -85 pitch = -4**

**15:59:08.148 -> Xa= 0.01 Ya= -1.05 Za= 0.00**

**15:59:08.194 -> roll= -89 pitch = 0**

**15:59:08.194 -> Xa= 0.07 Ya= -0.95 Za= 0.02**

**15:59:08.241 -> roll= -85 pitch = -4**

**15:59:08.287 -> Xa= 0.04 Ya= -0.97 Za= 0.01**

**15:59:08.287 -> roll= -87 pitch = -2**

**15:59:08.333 -> Xa= 0.09 Ya= -0.97 Za= -0.01**

**15:59:08.333 -> roll= -84 pitch = -5**

**15:59:08.380 -> Xa= 0.04 Ya= -1.04 Za= -0.01**

**15:59:08.426 -> roll= -88 pitch = -1**

**15:59:08.426 -> Xa= 0.02 Ya= -1.00 Za= 0.01**

**15:59:08.474 -> roll= -88 pitch = -1**

**15:59:08.474 -> Xa= 0.03 Ya= -1.05 Za= 0.01**

**15:59:08.520 -> roll= -88 pitch = -1**