Cheerful Maker
Makey

CATEGORY

GY-521 gyro and accel

1개의 GY-521을 Arduino Nano에 연결하는 경우.

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(*) MPU-6050 : 3축 회전자이로, 3축 가속측정, 온도 센서. 데이타를 읽는 것까지만 쉬움. 그 데이타로 필요한 일 하는 것이 진짜 어려운 부분. 여기서는 자료를 읽는데까지만 다룸.

GY-521를 한개만 아두에노에 연결해서 사용하는 경우.

회로도 (Circuit from web, I confirmed it works.)

인터넷에서 다운받은 회로도 중에서 확실하게 작동하는 회로,

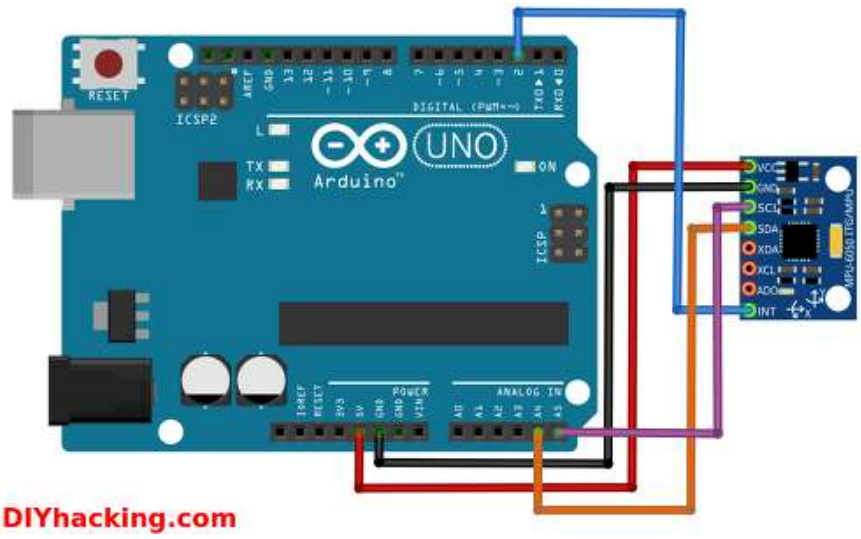
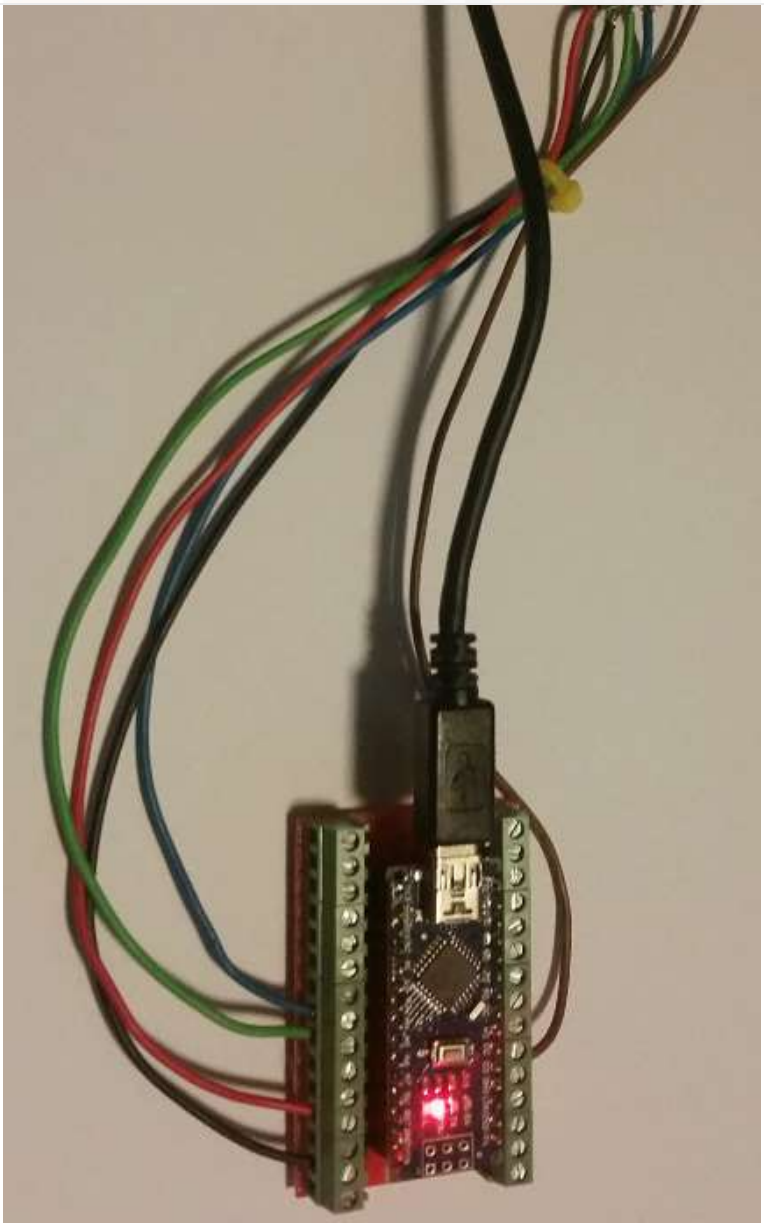
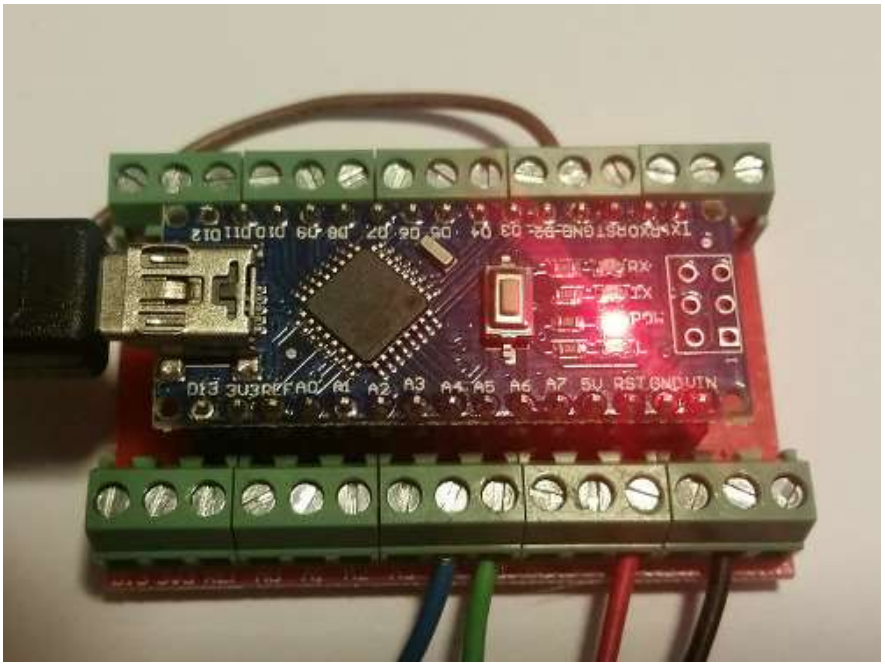
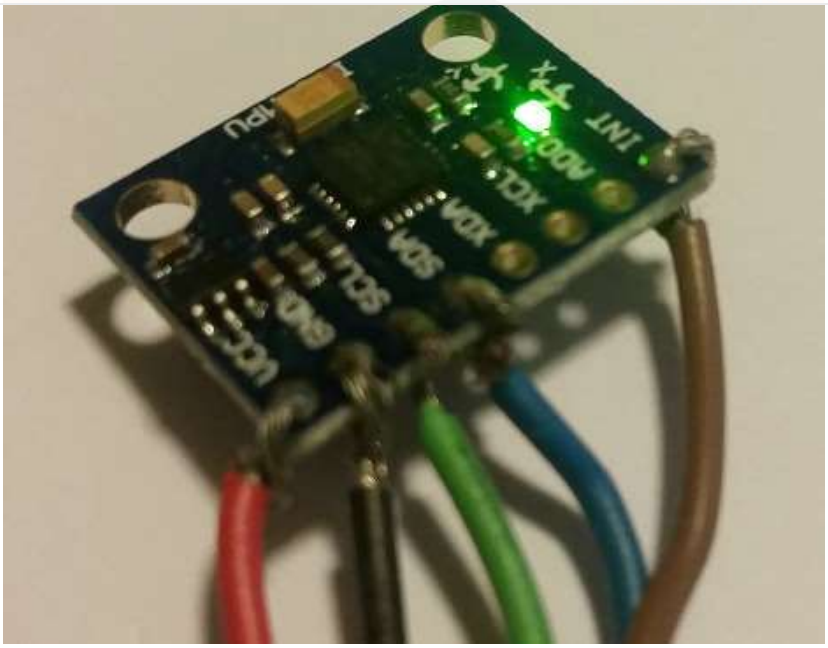


사진 :







프로그램 코드 (Program code)

- This code is from arduino IDE's sample code from example, and no need to change anything to make it work from above circuit.

```
// I2C device class (I2Cdev) demonstration Arduino sketch for MPU6050 class using DMP (MotionApps v2.0)
// 6/21/2012 by Jeff Rowberg <jeff@rowberg.net>
// Updates should (hopefully) always be available at https://github.com/jrowberg/i2cdevlib
//
// Changelog:
//     2013-05-08 - added seamless Fastwire support
//                - added note about gyro calibration
//     2012-06-21 - added note about Arduino 1.0.1 + Leonardo compatibility error
//     2012-06-20 - improved FIFO overflow handling and simplified read process
//     2012-06-19 - completely rearranged DMP initialization code and simplification
//     2012-06-13 - pull gyro and accel data from FIFO packet instead of reading directly
//     2012-06-09 - fix broken FIFO read sequence and change interrupt detection to RISING
//     2012-06-05 - add gravity-compensated initial reference frame acceleration output
//                - add 3D math helper file to DMP6 example sketch
//                - add Euler output and Yaw/Pitch/Roll output formats
//     2012-06-04 - remove accel offset clearing for better results (thanks Sungon Lee)
//     2012-06-01 - fixed gyro sensitivity to be 2000 deg/sec instead of 250
//     2012-05-30 - basic DMP initialization working

/* ============================================
```

```
// I2Cdev and MPU6050 must be installed as libraries, or else the .cpp/.h files
// for both classes must be in the include path of your project
#include "I2Cdev.h"

#include "MPU6050_6Axis_MotionApps20.h"
//#include "MPU6050.h" // not necessary if using MotionApps include file

// Arduino Wire library is required if I2Cdev I2CDEV_ARDUINO_WIRE implementation
// is used in I2Cdev.h
#if I2CDEV_IMPLEMENTATION == I2CDEV_ARDUINO_WIRE
  #include "Wire.h"
#endif

// class default I2C address is 0x68
// specific I2C addresses may be passed as a parameter here
// AD0 low = 0x68 (default for SparkFun breakout and InvenSense evaluation board)
// AD0 high = 0x69
MPU6050 mpu;
//MPU6050 mpu(0x69); // <-- use for AD0 high
```

/* ==
NOTE: In addition to connection 3.3v, GND, SDA, and SCL, this sketch
depends on the MPU-6050's INT pin being connected to the Arduino's
external interrupt #0 pin. On the Arduino Uno and Mega 2560, this is
digital I/O pin 2.
* == */

/* ==
NOTE: Arduino v1.0.1 with the Leonardo board generates a compile error
when using Serial.write(buf, len). The Teapot output uses this method.
The solution requires a modification to the Arduino USBAPI.h file, which
is fortunately simple, but annoying. This will be fixed in the next IDE
release. For more info, see these links:

http://arduino.cc/forum/index.php/topic,109987.0.html
http://code.google.com/p/arduino/issues/detail?id=958
* == */

```
// uncomment "OUTPUT_READABLE_QUATERNION" if you want to see the actual
// quaternion components in a [w, x, y, z] format (not best for parsing
// on a remote host such as Processing or something though)
//#define OUTPUT_READABLE_QUATERNION

// uncomment "OUTPUT_READABLE_EULER" if you want to see Euler angles
// (in degrees) calculated from the quaternions coming from the FIFO.
// Note that Euler angles suffer from gimbal lock (for more info, see
// http://en.wikipedia.org/wiki/Gimbal_lock)
//#define OUTPUT_READABLE_EULER

// uncomment "OUTPUT_READABLE_YAWPITCHROLL" if you want to see the yaw/
// pitch/roll angles (in degrees) calculated from the quaternions coming
// from the FIFO. Note this also requires gravity vector calculations.
// Also note that yaw/pitch/roll angles suffer from gimbal lock (for
// more info, see: http://en.wikipedia.org/wiki/Gimbal_lock)
#define OUTPUT_READABLE_YAWPITCHROLL

// uncomment "OUTPUT_READABLE_REALACCEL" if you want to see acceleration
// components with gravity removed. This acceleration reference frame is
// not compensated for orientation, so +X is always +X according to the
```

```
// uncomment "OUTPUT_READABLE_WORLDACCEL" if you want to see acceleration
// components with gravity removed and adjusted for the world frame of
// reference (yaw is relative to initial orientation, since no magnetometer
// is present in this case). Could be quite handy in some cases.
//#define OUTPUT_READABLE_WORLDACCEL

// uncomment "OUTPUT_TEAPOT" if you want output that matches the
// format used for the InvenSense teapot demo
//#define OUTPUT_TEAPOT



#define LED_PIN 13 // (Arduino is 13, Teensy is 11, Teensy++ is 6)
bool blinkState = false;

// MPU control/status vars
bool dmpReady = false;  // set true if DMP init was successful
uint8_t mpuIntStatus;   // holds actual interrupt status byte from MPU
uint8_t devStatus;      // return status after each device operation (0 = success, !0 = error)
uint16_t packetSize;    // expected DMP packet size (default is 42 bytes)
uint16_t fifoCount;     // count of all bytes currently in FIFO
uint8_t fifoBuffer[64]; // FIFO storage buffer

// orientation/motion vars
Quaternion q;           // [w, x, y, z]         quaternion container
VectorInt16 aa;         // [x, y, z]            accel sensor measurements
VectorInt16 aaReal;     // [x, y, z]            gravity-free accel sensor measurements
VectorInt16 aaWorld;    // [x, y, z]            world-frame accel sensor measurements
VectorFloat gravity;    // [x, y, z]            gravity vector
float euler[3];         // [psi, theta, phi]    Euler angle container
float ypr[3];           // [yaw, pitch, roll]   yaw/pitch/roll container and gravity vector

// packet structure for InvenSense teapot demo
uint8_t teapotPacket[14] = { '$', 0x02, 0,0, 0,0, 0,0, 0,0, 0x00, 0x00, '\r', '\n' };



// ================================================================
```

```
volatile bool mpuInterrupt = false;     // indicates whether MPU interrupt pin has gone high
void dmpDataReady() {
  mpuInterrupt = true;
}



// ================================================================
// ===                      INITIAL SETUP                       ===
// ================================================================

void setup() {
  // join I2C bus (I2Cdev library doesn't do this automatically)
  #if I2CDEV_IMPLEMENTATION == I2CDEV_ARDUINO_WIRE
    Wire.begin();
    TWBR = 24; // 400kHz I2C clock (200kHz if CPU is 8MHz). Comment this line if having compilation
difficulties with TWBR.
  #elif I2CDEV_IMPLEMENTATION == I2CDEV_BUILTIN_FASTWIRE
    Fastwire::setup(400, true);
  #endif

  // initialize serial communication
  // (115200 chosen because it is required for Teapot Demo output, but it's
  // really up to you depending on your project)
  Serial.begin(115200);
  while (!Serial); // wait for Leonardo enumeration, others continue immediately

  // NOTE: 8MHz or slower host processors, like the Teensy @ 3.3v or Ardunio
  // Pro Mini running at 3.3v, cannot handle this baud rate reliably due to
  // the baud timing being too misaligned with processor ticks. You must use
  // 38400 or slower in these cases, or use some kind of external separate
  // crystal solution for the UART timer.

  // initialize device
  Serial.println(F("Initializing I2C devices..."));
  mpu.initialize();

  // verify connection
  Serial.println(F("Testing device connections..."));
```

```
// wait for ready
Serial.println(F("\nSend any character to begin DMP programming and demo: "));
while (Serial.available() && Serial.read()); // empty buffer
while (!Serial.available());                 // wait for data
while (Serial.available() && Serial.read()); // empty buffer again

// load and configure the DMP
Serial.println(F("Initializing DMP..."));
devStatus = mpu.dmpInitialize();

// supply your own gyro offsets here, scaled for min sensitivity
mpu.setXGyroOffset(220);
mpu.setYGyroOffset(76);
mpu.setZGyroOffset(-85);
mpu.setZAccelOffset(1788); // 1688 factory default for my test chip

// make sure it worked (returns 0 if so)
if (devStatus == 0) {
    // turn on the DMP, now that it's ready
    Serial.println(F("Enabling DMP..."));
    mpu.setDMPEnabled(true);

    // enable Arduino interrupt detection
    Serial.println(F("Enabling interrupt detection (Arduino external interrupt 0)..."));
    attachInterrupt(0, dmpDataReady, RISING);
    mpuIntStatus = mpu.getIntStatus();

    // set our DMP Ready flag so the main loop() function knows it's okay to use it
    Serial.println(F("DMP ready! Waiting for first interrupt..."));
    dmpReady = true;

    // get expected DMP packet size for later comparison
    packetSize = mpu.dmpGetFIFOPacketSize();
} else {
    // ERROR!
    // 1 = initial memory load failed
    // 2 = DMP configuration updates failed
    // (if it's going to break, usually the code will be 1)
    Serial.print(F("DMP Initialization failed (code "));
```

```
    // configure LED for output
    pinMode(LED_PIN, OUTPUT);
}



// ================================================================
// ===                MAIN PROGRAM LOOP                ===
// ================================================================

void loop() {
    // if programming failed, don't try to do anything
    if (!dmpReady) return;

    // wait for MPU interrupt or extra packet(s) available
    while (!mpuInterrupt && fifoCount < packetSize) {
        // other program behavior stuff here
        // .
        // .
        // .
        // if you are really paranoid you can frequently test in between other
        // stuff to see if mpuInterrupt is true, and if so, "break;" from the
        // while() loop to immediately process the MPU data
        // .
        // .
        // .
    }

    // reset interrupt flag and get INT_STATUS byte
    mpuInterrupt = false;
    mpuIntStatus = mpu.getIntStatus();

    // get current FIFO count
    fifoCount = mpu.getFIFOCount();

    // check for overflow (this should never happen unless our code is too inefficient)
    if ((mpuIntStatus & 0x10) || fifoCount == 1024) {
        // reset so we can continue cleanly
```

```
// otherwise, check for DMP data ready interrupt (this should happen frequently)
} else if (mpuIntStatus & 0x02) {
    // wait for correct available data length, should be a VERY short wait
    while (fifoCount < packetSize) fifoCount = mpu.getFIFOCount();

    // read a packet from FIFO
    mpu.getFIFOBytes(fifoBuffer, packetSize);

    // track FIFO count here in case there is > 1 packet available
    // (this lets us immediately read more without waiting for an interrupt)
    fifoCount -= packetSize;

    #ifdef OUTPUT_READABLE_QUATERNION
        // display quaternion values in easy matrix form: w x y z
        mpu.dmpGetQuaternion(&q, fifoBuffer);
        Serial.print("quat\t");
        Serial.print(q.w);
        Serial.print("\t");
        Serial.print(q.x);
        Serial.print("\t");
        Serial.print(q.y);
        Serial.print("\t");
        Serial.println(q.z);
    #endif

    #ifdef OUTPUT_READABLE_EULER
        // display Euler angles in degrees
        mpu.dmpGetQuaternion(&q, fifoBuffer);
        mpu.dmpGetEuler(euler, &q);
        Serial.print("euler\t");
        Serial.print(euler[0] * 180/M_PI);
        Serial.print("\t");
        Serial.print(euler[1] * 180/M_PI);
        Serial.print("\t");
        Serial.println(euler[2] * 180/M_PI);
    #endif

    #ifdef OUTPUT_READABLE_YAWPITCHROLL
        // display Euler angles in degrees
```

```
    Serial.print("ypr\t");
    Serial.print(ypr[0] * 180/M_PI);
    Serial.print("\t");
    Serial.print(ypr[1] * 180/M_PI);
    Serial.print("\t");
    Serial.println(ypr[2] * 180/M_PI);
  #endif

  #ifdef OUTPUT_READABLE_REALACCEL
    // display real acceleration, adjusted to remove gravity
    mpu.dmpGetQuaternion(&q, fifoBuffer);
    mpu.dmpGetAccel(&aa, fifoBuffer);
    mpu.dmpGetGravity(&gravity, &q);
    mpu.dmpGetLinearAccel(&aaReal, &aa, &gravity);
    Serial.print("areal\t");
    Serial.print(aaReal.x);
    Serial.print("\t");
    Serial.print(aaReal.y);
    Serial.print("\t");
    Serial.println(aaReal.z);
  #endif

  #ifdef OUTPUT_READABLE_WORLDACCEL
    // display initial world-frame acceleration, adjusted to remove gravity
    // and rotated based on known orientation from quaternion
    mpu.dmpGetQuaternion(&q, fifoBuffer);
    mpu.dmpGetAccel(&aa, fifoBuffer);
    mpu.dmpGetGravity(&gravity, &q);
    mpu.dmpGetLinearAccel(&aaReal, &aa, &gravity);
    mpu.dmpGetLinearAccelInWorld(&aaWorld, &aaReal, &q);
    Serial.print("aworld\t");
    Serial.print(aaWorld.x);
    Serial.print("\t");
    Serial.print(aaWorld.y);
    Serial.print("\t");
    Serial.println(aaWorld.z);
  #endif

  #ifdef OUTPUT_TEAPOT
```

```
        teapotPacket[4] = fifoBuffer[4];
        teapotPacket[5] = fifoBuffer[5];
        teapotPacket[6] = fifoBuffer[8];
        teapotPacket[7] = fifoBuffer[9];
        teapotPacket[8] = fifoBuffer[12];
        teapotPacket[9] = fifoBuffer[13];
        Serial.write(teapotPacket, 14);
        teapotPacket[11]++; // packetCount, loops at 0xFF on purpose
      #endif

      // blink LED to indicate activity
      blinkState = !blinkState;
      digitalWrite(LED_PIN, blinkState);
    }
}
```


'GY-521 gyro and accel' 카테고리의 다른 글

1개의 GY-521을 Arduino Nano에 연결하는 경우. (0)
Dual GY-521 - 두개 사용하기 (왼쪽 달팽이관 + 오... (0)