Sketch program self-leveling tripod

```
#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



// 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
// sensor, just without the effects of gravity. If you want acceleration
// compensated for orientation, us OUTPUT_READABLE_WORLDACCEL instead.
//#define OUTPUT_READABLE_REALACCEL

// 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' };

 // setting pin ----------------------
  int kanan_naik = 9;
  int kanan_turun = 8;
  int kiri_naik = 7;
  int kiri_turun = 6;
  int depan_naik = 5;
  int depan_turun = 4;
void depan(int x) {
  switch (x) {
```

```
    case 0 :
        digitalWrite(depan_naik,LOW);
        digitalWrite(depan_turun,LOW);
        break;
    case 1 :
        digitalWrite(depan_naik,HIGH);
        digitalWrite(depan_turun,LOW);
        break;
    case 2 :
        digitalWrite(depan_turun,HIGH);
        digitalWrite(depan_naik,LOW);
       break;
  }
}
void ka_naik() {
  digitalWrite(kanan_naik,HIGH);
  digitalWrite(kanan_turun,LOW);
}

void ka_turun() {
  digitalWrite(kanan_turun,HIGH);
  digitalWrite(kanan_naik,LOW);
}

void ki_naik() {
  digitalWrite(kiri_naik,HIGH);
  digitalWrite(kiri_turun,LOW);
}

void ki_turun() {
```

```
  digitalWrite(kiri_turun,HIGH);
  digitalWrite(kiri_naik,LOW);
}

void ka_stop() {
  digitalWrite(kanan_turun,LOW);
  digitalWrite(kanan_naik,LOW);
}

void ki_stop() {
  digitalWrite(kiri_naik,LOW);
  digitalWrite(kiri_turun,LOW);
}

// ================================================================
// ===              INTERRUPT DETECTION ROUTINE                ===
// ================================================================

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)
    #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..."));
    Serial.println(mpu.testConnection() ? F("MPU6050 connection successful") : F("MPU6050 connection
failed"));

    // 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 "));
        Serial.print(devStatus);
        Serial.println(F(")"));
    }

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

  pinMode(kanan_naik,OUTPUT);  //motor kanan naik-putar ke kanan
  pinMode(kanan_turun,OUTPUT);  // motor kanan turun-putar ke kiri
  pinMode(kiri_turun,OUTPUT); //motor kiri turun-putar ke kiri
  pinMode(kiri_naik,OUTPUT); //motor kiri naik-putar ke kanan
pinMode(depan_turun,OUTPUT); //motor kiri turun-putar ke kiri
  pinMode(depan_naik,OUTPUT); //motor kiri naik-putar ke kanan
}



// ================================================================
// ===                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
    mpu.resetFIFO();
   // Serial.println(F("FIFO overflow!"));
```

```
// 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
    mpu.dmpGetQuaternion(&q, fifoBuffer);
    mpu.dmpGetGravity(&gravity, &q);
    mpu.dmpGetYawPitchRoll(ypr, &q, &gravity);
    Serial.print("r p \t");
    int roll_ = ypr[2] * 180/M_PI;
    Serial.print(roll_);
  if (roll_<=-2) {
   ka_naik();
  delay(1000);
  ka_stop();
   }
 else if (roll_ >= 2) {
  ki_naik();
 delay(1000);
 ki_stop();
 }
   int pitch_ = ypr[1] * 180/M_PI;
   Serial.print("\t");
   Serial.println (pitch_);
  if ((roll_ <2)&&(roll_ >-2)) {
    if (pitch_ <=-2) {
```

```
     depan(1);
      delay(1000);
depan(0);
   }
  else if (pitch_ >=2) {
   depan(2);
   delay(1000);
   depan(0);
   }
  }
#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
            // display quaternion values in InvenSense Teapot demo format:
            teapotPacket[2] = fifoBuffer[0];
            teapotPacket[3] = fifoBuffer[1];
            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);
    }
}
```