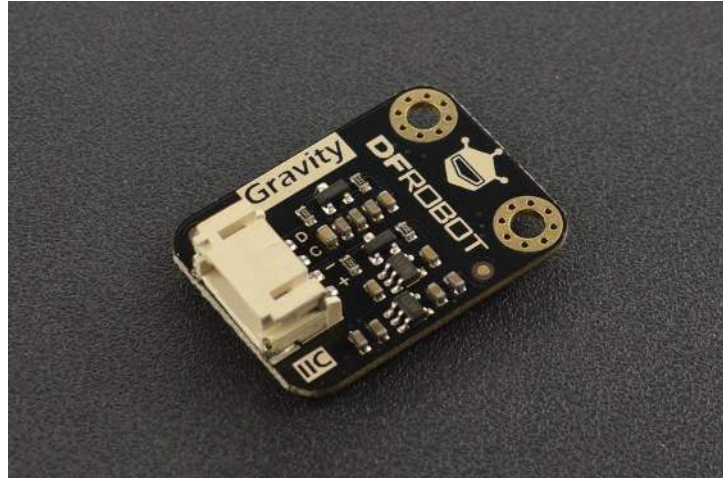# Gravity: PAJ7620U2 Gesture Sensor

SKU:SEN0315

Introduction

Build an awesome interactive project with this PAJ7620U2 Gesture Sensor! It is an interactive sensor with 3D gesture recognition that can recognize 13 gestures at most within 20cm.

There are two recognition modes for this sensor: fast mode (9 gestures) and slow mode (13 gestures). In fast detection mode, the sensor can recognize 9 gestures: move left, right, up, down, forward, backward, clockwise, counter-clockwise, wave. The slow mode can recognize 4 expanded gestures besides the 9 basic gestures: slowly move left and right, slowly move up and down, slowly move forward and backward, move randomly. The unit sampling time can be defined by users in this mode. Moreover, users can customize their own gestures if necessary.

The sensor offers stable performance, fast response and high accuracy, which makes it an excellent choice for interactive applications like non-contact remote controller, interactive robot, gesture-based game device, smart lighting management, and so on.

Specification

- Operating Voltage: 3.3V-5V
- Operating Current: 3.5mA
- Communication Port: Gravity-IIC 4Pin
- IIC Address: 0x73

- Dimension: 30x22mm/1.18x0.87"
- Mounting Hole Size: 15mm/0.59"
- Detection Distance: 3cm-20cm
- Update Rate: 120Hz
- Operating Temperature: -40℃~85℃
- Ambient Light Immunity: <100k Lux
- Cover Board Material: glass or PC; transparency>90%; Board thickness<0.7 (Place the cover board and the module as close as possible, and the distance between them should not be over 0.2mm.)
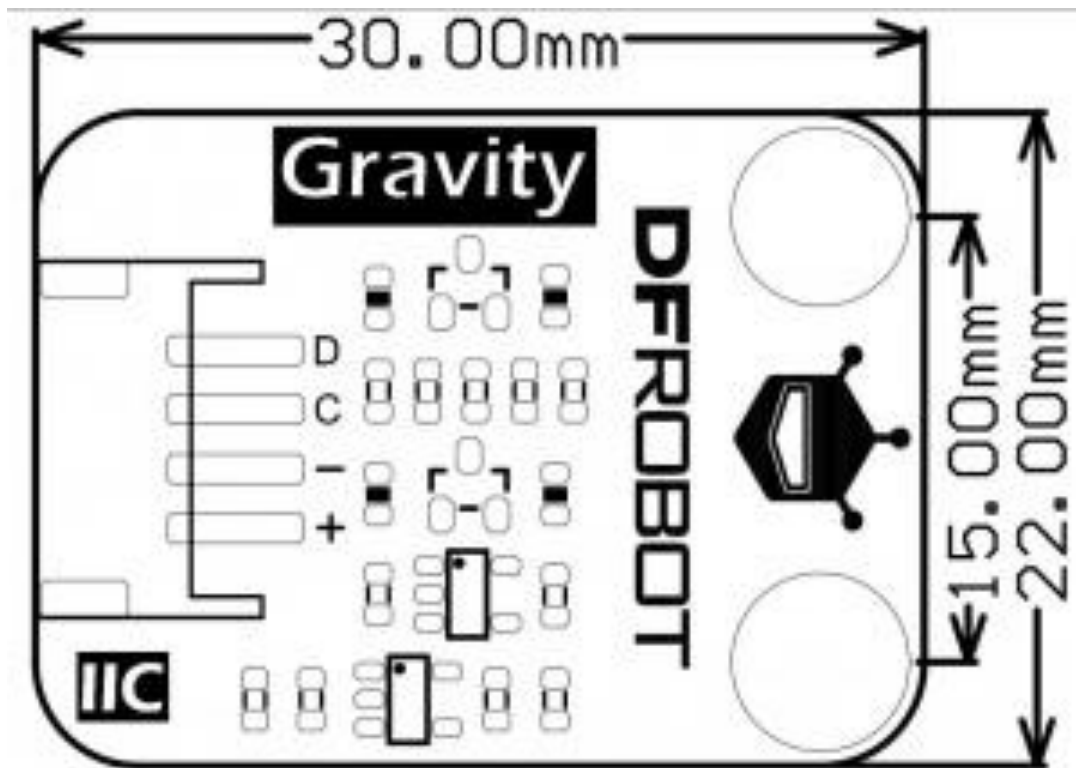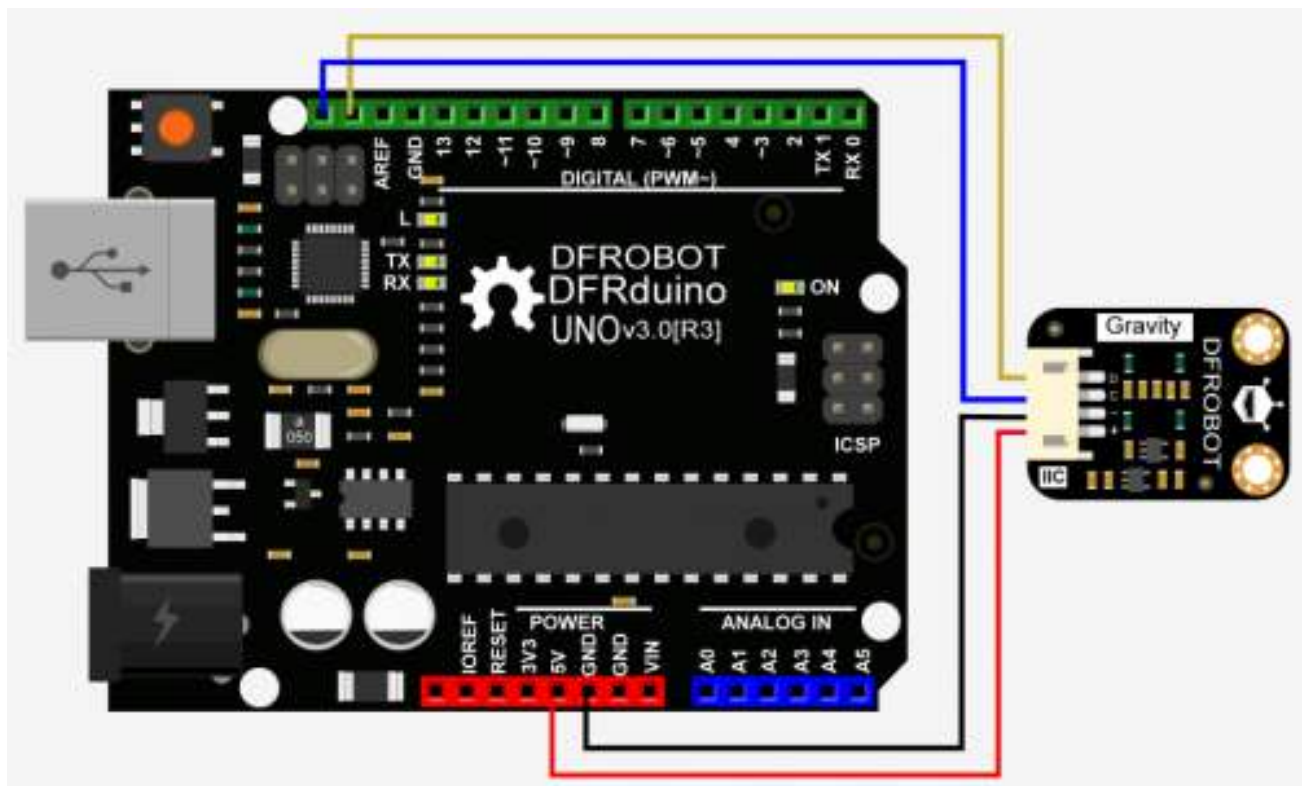
Board OverView

Silkscreen	Description
D	IIC SDA
C	IIC SCL
-	Negative
+	Positive

Tutorial

Requirements

- **Hardware**

  - DFRduino UNO R3 (or similar) x 1
  - IO Expansion Shield x1
  - Gravity: PAJ7620U2 Gesture Sensor

- **Software**

  - Arduino IDE
  - Download and install the **PAJ7620U2 Example Library** (About how to install the library?)

Connection Diagram

Sample Code

Functions for reference:

```
DFRobot_PAJ7620U2(TwoWire *pWire=&Wire);
 /**
  * @brief Constructor
  * @param mode Call the function and designate the device's default working mode.
  */
 int begin(void)
  /**
  * @brief Init function
  * @return Return 0 if the initialization succeeds, otherwise return non-zero.
  */
void setGestureHighRate(bool b);
  /**
  * @brief Set the gesture recognition mode
   * @param b true Fast detection mode, recognize gestures quickly and return.
   * @n   false Slow detection mode, the system will do more judgements.
   * @n   In fast detection mode, the sensor can recognize 9 gestures: move left,
right, up, down, forward,
   * @n   backward, clockwise, counter-clockwise, wave.
   * @n   To detect the combination of these gestures, like wave left, right and left
quickly, users need to
   * @n   design their own algorithms logic.
   * @n   Since users only use limited gestures, we didn't integrate too much expanded
gestures in the library.
   * @n   If necessary, you can complete the algorithm logic in the ino file by
yourself.
   * @n
   * @n
   * @n   In slow detection mode, the sensor recognize one gesture every 2 seconds,
and we have integrated the
   * @n   expanded gestures inside the library, which is convenient for the beginners
to use.
   * @n   The slow mode can recognize 9  basic gestures and 4 expanded gestures: move
left, right, up, down,
   * @n   forward, backward, clockwise, counter-clockwise, wave, slowly move left and
right, slowly move up
   * @n   and down, slowly move forward and backward, wave slowly and randomly.
   */
 String gestureDescription(eGesture_t gesture);
 /**
   * @brief Get the string descritpion corresponding to the gesture number.
   * @param gesture Gesture number inlcuded in the eGesture_t
   * @return Textual description corresponding to the gesture number:if the gesture
input in the gesture table
   * @n doesn't exist, return null string
   * @n Normally, it may return "None","Right","Left", "Up", "Down", "Forward",
"Backward", "Clockwise",
   * @n "Anti-Clockwise", "Wave", "WaveSlowlyDisorder", "WaveSlowlyLeftRight",
"WaveSlowlyUpDown",
```

```
   * @n "WaveSlowlyForwardBackward"
  */
eGesture_t getGesture(void);
/**
   * @brief Get gesture
   * @return The gesture value it may return: eGestureNone  eGestureRight
eGestureLeft  eGestureUp
   * @n      eGestureDown  eGestureForward  eGestureBackward  eGestureClockwise
   * @n      eGestureWave  eGestureWaveSlowlyDisorder  eGestureWaveSlowlyLeftRight
   * @n      eGestureWaveSlowlyUpDown  eGestureWaveSlowlyForwardBackward
   */
```

Fast Detection Mode

Code function: recognize the following gestures.

Note: the clockwise and anti-clockwise gesture detection requires at least two repeated motions.

The available gestures in fast detection mode:

Gesture Code	Gesture Description
1	Right
2	Left
4	Up
8	Down
16	Forward
32	Backward
64	Clockwise

Gesture Code	Gesture Description
128	Anti-clockwise
256	Wave(Quickly)

```
/*!
 * @file GestureRecognize_HighRate.ino
 * @brief Present the 9 built-in gestures data the sensor supports.
 * @n Wave your hand above the sensor (within 0~20cm), it can recognize 9 kinds of
gestures: move up, down, left, right, forward,
 * @n backward, clockwise, anti-clockwise, wave.
 * @n For more usages of the sensor, refer to the description about
setGestureHighRate in function setup.
 *
 * @copyright   Copyright (c) 2010 DFRobot Co.Ltd (http://www.dfrobot.com)
 * @licence     The MIT License (MIT)
 * @author      Alexander(ouki.wang@dfrobot.com)
 * @version  V1.0
 * @date  2019-07-16
 * @get from https://www.dfrobot.com
 * @url https://github.com/DFRobot/DFRobot_PAJ7620U2
 */

#include <DFRobot_PAJ7620U2.h>

DFRobot_PAJ7620U2 paj;

void setup()
{
  Serial.begin(115200);
  delay(300);
  Serial.println("Gesture recognition system base on PAJ7620U2");
  while(paj.begin() != 0){
    Serial.println("initial PAJ7620U2 failure! Please check if all the connections
are fine, or if the wire sequence is correct?");
    delay(500);
  }
  Serial.println("PAJ7620U2 init completed, start to test the gesture recognition
function");

  /*Set fast detection mode
   *If the parameter is set to false, the module enters slow detection mode, and it
detects one gesture every 2s. We have integrated
   *some gestures inside the module to make it convenient for beginners.
   *The slow mode can recognize 9  basic gestures and 4 expanded gestures: move left,
right, up, down, forward, backward, clockwise,
   *counter-clockwise, wave, slowly move left and right, slowly move up and down,
slowly move forward and backward,
   *wave slowly and randomly.
```
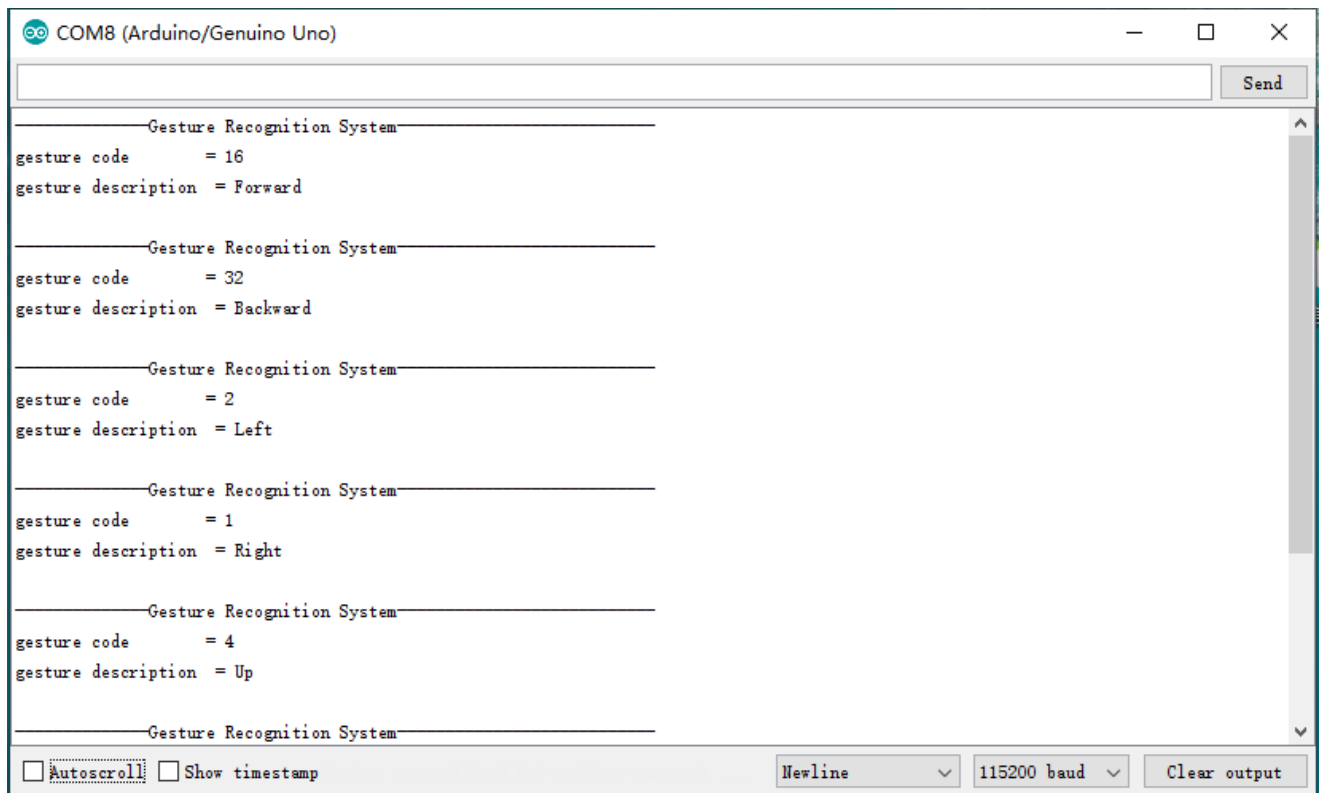
```
     *
     *
     *
     *If the parameter is set to true, the module enters fast detection mode.
     *The fast mode can recognize 9 gestures: move left, right, up, down, forward,
 backward, clockwise, counter-clockwise, wave
     *To detect the combination of these gestures, like wave left, right and left
 quickly, users needs to design their own algorithms logic.
     *Since users only use limited gestures in this mode, we are not going to integrate
 too much expanded gestures in the library.
     *If necessary, you can complete the algorithm logic in the ino file by yourself.
     */
   paj.setGestureHighRate(true);

 }

 void loop()
 {
   /* Read gesture number (return eGesture_t enumerated type)
    * eGestureNone  eGestureRight  eGestureLeft  eGestureUp  eGestureDown
 eGestureForward
    * eGestureBackward  eGestureClockwise  eGestureAntiClockwise  eGestureWave
 eGestureWaveSlowlyDisorder
    * eGestureWaveSlowlyLeftRight  eGestureWaveSlowlyUpDown
 eGestureWaveSlowlyForwardBackward
    */
   DFRobot_PAJ7620U2::eGesture_t gesture = paj.getGesture();
   if(gesture != paj.eGestureNone ){
    /* Get the string descritpion corresponding to the gesture number.
     * The string description could be
     * "None","Right","Left", "Up", "Down", "Forward", "Backward", "Clockwise", "Anti-
 Clockwise", "Wave",
     * "WaveSlowlyDisorder", "WaveSlowlyLeftRight", "WaveSlowlyUpDown",
 "WaveSlowlyForwardBackward"
     */
     String description  = paj.gestureDescription(gesture);//Convert gesture number
 into string description
     Serial.println("--------------Gesture Recognition System------------------------
 --");
     Serial.print("gesture code        = ");Serial.println(gesture);
     Serial.print("gesture description  = ");Serial.println(description);
     Serial.println();
   }
 }
```

Expected Results

Serial print the code and description of 9 gestures.

```
——————————Gesture Recognition System——————————
gesture code       = 16
gesture description  = Forward

——————————Gesture Recognition System——————————
gesture code       = 32
gesture description  = Backward

——————————Gesture Recognition System——————————
gesture code       = 2
gesture description  = Left

——————————Gesture Recognition System——————————
gesture code       = 1
gesture description  = Right

——————————Gesture Recognition System——————————
gesture code       = 4
gesture description  = Up

——————————Gesture Recognition System——————————
```

Slow Detection Mode

> Note: the default samping time in slow mode is 2s, so you need to wait for 1s when completed one detection.

The available gestures in slow detection mode:

Gesture Code	Gesture Description
1	Right
2	Left
3	WaveSlowlyLeftRight
4	Up

Gesture Code	Gesture Description
8	Down
12	WaveSlowlyUpDown
16	Forward
32	Backward
48	WaveSlowlyForwardBackward
64	Clockwise
128	Anti-clockwise
256	Wave(quickly)
512	WaveSlowlyDisorder

```
#include <DFRobot_PAJ7620U2.h>

/*!
 * @file GestureRecognize_LowRate.ino
 * @brief Present the 9 built-in gestures the sensor supports and 4 extended gestures
in the slow mode.
 * @n Wave you hand above the sensor(within 0~20cm), it can detect: move left, right,
up, down, forward, backward, clockwise,
 * @n anti-clockwise, wave, slowly move left and right, slowly move up and down,
slowly move forward and backward, wave randomly and slowly.
 * @n For more usages of the sensor, refer to the description about setGestureLowRate
in function setup.
 *
 * @copyright   Copyright (c) 2010 DFRobot Co.Ltd (http://www.dfrobot.com)
 * @licence     The MIT License (MIT)
 * @author      Alexander(ouki.wang@dfrobot.com)
 * @version  V1.0
 * @date  2019-07-16
 * @get from https://www.dfrobot.com
 * @url https://github.com/DFRobot/DFRobot_PAJ7620U2
 */
```

```
#include <DFRobot_PAJ7620U2.h>

DFRobot_PAJ7620U2 paj;

void setup()
{
  Serial.begin(115200);
  delay(300);
  Serial.println("Gesture recognition system base on PAJ7620U2");
  while(paj.begin() != 0){
    Serial.println("initial PAJ7620U2 failure! Please check if all the connections
are fine, or if the wire sequence is correct?");
    delay(500);
  }
  Serial.println("PAJ7620U2init completed, start to test the gesture recognition
function");

  /*Set fast detection mode
   *If the parameter is set to false, the module enters slow detection mode, and it
detects one gesture every 2s. We have integrated
   *some gestures inside the module to make it convenient for beginners.
   *The slow mode can recognize 9  basic gestures and 4 expanded gestures: move left,
right, up, down, forward, backward, clockwise,
   *counter-clockwise, wave, slowly move left and right, slowly move up and down,
slowly move forward and backward,
   *wave slowly and randomly.
   *
   *
   *
   *If the parameter is set to true, the module enters fast detection mode.
   *The fast mode can recognize 9 gestures: move left, right, up, down, forward,
backward, clockwise, counter-clockwise, wave.
   *To detect the combination of these gestures, like wave left, right and left
quickly, users needs to design their own
   *algorithms logic.
   *Since users only use limited gestures in this mode, we are not going to integrate
too much expanded gestures in the library.
   *If necessary, you can complete the algorithm logic in the ino file by yourself.
   */
  paj.setGestureHighRate(false);

}

void loop()
{
  /* Read gesture number (return eGesture_t enumerated type)
   * eGestureNone  eGestureRight  eGestureLeft  eGestureUp  eGestureDown
eGestureForward
   * eGestureBackward  eGestureClockwise  eGestureAntiClockwise  eGestureWave
eGestureWaveSlowlyDisorder
   * eGestureWaveSlowlyLeftRight  eGestureWaveSlowlyUpDown
eGestureWaveSlowlyForwardBackward
   */
  DFRobot_PAJ7620U2::eGesture_t gesture = paj.getGesture();
```

```
  if(gesture != paj.eGestureNone ){
   /* Get the string descritpion corresponding to the gesture number.
    * The string description could be
    * "None","Right","Left", "Up", "Down", "Forward", "Backward", "Clockwise", "Anti-
Clockwise", "Wave",
    * "WaveSlowlyDisorder", "WaveSlowlyLeftRight", "WaveSlowlyUpDown",
"WaveSlowlyForwardBackward"
    */
    String description  = paj.gestureDescription(gesture);//Convert gesture number
into string description
    Serial.println("--------------Gesture Recognition System------------------------
--");
    Serial.print("gesture code         = ");Serial.println(gesture);
    Serial.print("gesture description  = ");Serial.println(description);
    Serial.println();
  }
}
```

Expected Result

Serial print the code and description of 13 gestures:

FAQ

For any questions, advice or cool ideas to share, please visit the **DFRobot Forum**

More Documents

- Schematics
- Datasheet
- SVG File
- Demo video for fast detection mode
- Demo video for slow detection mode