DG5 VHand 2.0 OEM
Technical Datasheet

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Product Description

The new DG5 VHand data glove is a complete and innovative sensor. Thanks to its five embedded bend sensors, it is possible to accurately measure the finger movements, while the embedded 3 axes accelerometer allows to sense both the hand movements and the hand orientation (roll and pitch).

The glove communicates with external devices via a 4 wires connector. The transmission is made via TTL levels and it uses a standard RS232 protocol at 115200 bps, so interfacing the device to a PC or a microcontroller is really immediate.

The glove can be powered from 3.3V to 5V and it is really power safe, it consumes less than 20mA. It has been developed for wireless and autonomous operations and it can be powered with a battery, guaranteeing a long operative period.

The data glove can be used in different applications: robotics, motion capture, virtual reality, innovative games, rehabilitation and also as an innovative aid for disabled people.

Technical Characteristics

- **Power Supply:** from 3.3V to 5.0 V

- **Load Current:** 20mA

- **Operating Temperature:** from 0 to 50 °C

- **Storage Temperature:** from 0 to 70 °C

- **Finger Sensing Resolution:** 10 bit (1024 step)

- **Number of finger sensor:** 5 (one per finger)

- **Hand orientation resolution:** 0.5°

- **Measured Hand Acceleration:** from -2g to 2g

- **Sampling Rate:** 25Hz

- **Glove dimension:** one size fits many size (elastic). The glove is available both in right and left version

- **Output Connector:** standard AMP connector, 4 ways (GND, Vcc, TX and RX signals)

- **Output High (1) signal level (RX and TX): from 2.8 to 3.3V**

- **Output Low (0) signal level (RX and TX): from 0.0V to 0.3V**

Interfacing the dataglove

The output connector

Illustration 1: External connector, Pin numeration
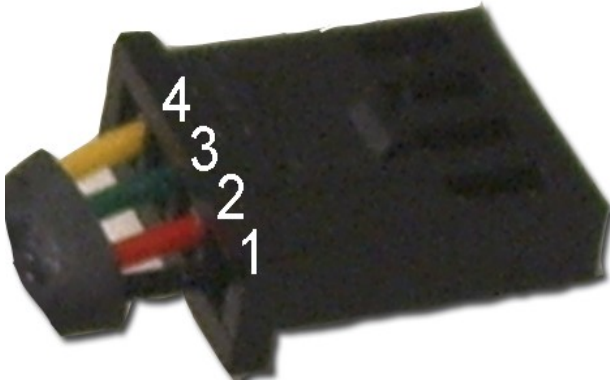
Pin description:

- 1 (Black): GND
- 2 (Red): Vcc
- 3 (Green): RX
- 4 (Yellow): TX

In order to power the data glove, it is needed to provide a supply from 3.3V to 5.0V on the Vcc pin. The RX and the TX pin are used for the communication;

RX: receive, the dataglove listens here the data from the controlling device;

TX: transmit, the dataglove sends on this pin the data package, containing the dataglove status;

Communication Protocol:

Serial Port Setting:

Baud Rate: 115200 BPS
Data Bit: 8
Stop Bit: 1
Parity: NONE

- start transmission (controller to dataglove): send 's' to the glove;
- (Data glove to controller): the glove transmits the package continuously;
- stop transmission (controller to dataglove): send 'e' to the glove;

Package structure:

The glove continuously transmits to the host device the following 20 byte package:
```
1 - header = 0x20
2 - header = 0x0A
3 - length = 0x14 (20 byte)
4 - acceleration axis ax_l
5 - acceleration axis ax_h
6 - acceleration axis ay_l
7 - acceleration axis ay_h
8 - acceleration axis az_l
9 - acceleration axis az_h
10- bend 0_l
```

```
11 - bend 0_h
12 - bend 1_l
13- bend 1_h
14- bend 2_l
15- bend 2_h
16 - bend 3_l
17 - bend 3_h
18 - bend 4_l
19 - bend 4_h
20 - crc
```

CRC represents the XOR of the first 19 bytes.
Bend value are from 0 to 1023 so only 10 bit are used.

The acceleration values are from -32767 to +32767.
The relative accelerations can be computed with the following relations:

$$Acc_x = 2*(ax_l + ax_h*128)*sign(ax_h)/32767;$$

$$Acc_y = 2*(ay_l + ay_h*128)*sign(ay_h)/32767;$$

$$Acc_x = 2*(az_l + az_h*128)*sign(az_h)/32767;$$

The value are from -2g to +2g.

Finger reference:

In the following picture are reported the finger reference for both the right and the left dataglove versions.

Right Version:

Thumb	Bend 0
Index	Bend 1
Middle	Bend 2
Ring	Bend 3
Little	Bend 4

Left Version:

Thumb	Bend 4
Index	Bend 3
Middle	Bend 2
Ring	Bend 1
Little	Bend 0

Illustration 2: Right dataglove: bend sensor reference

Hand movement measures

Acceleration axis reference:

The dataglove incorporates a 3 axes accelerometer able to measure the hand acceleration along the 3 main axes. The hand orientations (roll and pitch) can be extracted from these information. In the following picture it is explained the data glove axes reference.
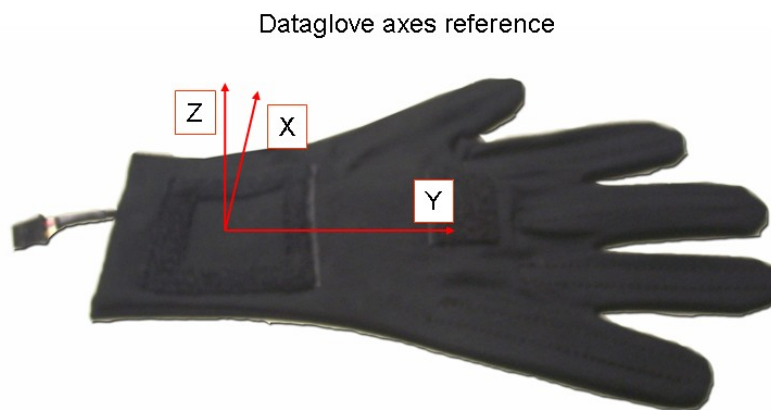

Illustration 3: Data glove axes reference

Hand orientation: roll and pitch

The accelerations can be divided in two types: dynamic and static. The 3 axes accelerometer measures both the types. A dynamic acceleration is a measure of the instantaneous movement of the hand along one a the three axes. Static accelerations are due to the the gravity force, for example rolling the hand around the y axis (roll) will modify the acceleration measured along the x axis and along the z axis, since the component of the gravity along these axes is modified, then the pitch angle can be deduced, for example, by getting the static measure of the x acceleration. Vice versa, rotating the hand along the x axis (pitch) will modify the measured y acceleration, so the pitch angle can be measured.
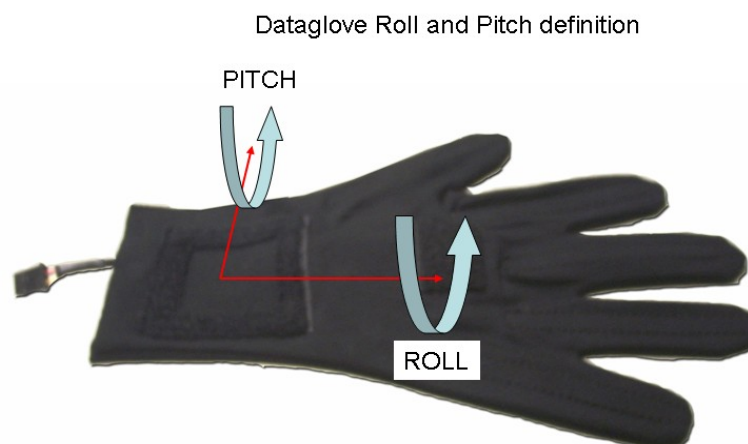

Illustration 4: Roll and Pitch angle

Accessories

The DG5 VHand 2.0 OEM is provided as is, so the customer has to develop its own communication board.

In order to facilitate and accelerate the developing, some accessories are available; this accessories can be bought separately or with the data glove DDK package (see later in this section).

VHand USB Cable

A ttll to usb cable which permits to immediately connect the data glove to a USB port of a PC. The cable provide also the Vcc, so an external power supply is not necessary;

RIF: VUSB

VHand Bluetooth Kit

A TTL to Bluetooth adapter with an external battery; simply connect the glove and the battery to the adapter and start communicating with the glove in a wireless way. A BlueTooth receiver or a PC with a BlueTooth connection is needed.

RIF: VBLUE

DG5 Vhand 2.0 DDK:

To facilitate the developers, two complete DDK (Device Developing Kit) are available.

DG5 VHand 2.0 USB DDK:

The kit comprises:

1 DG5 Vhand 2.0 OEM

1 TTL to USB adapter cable

1 CD containing all the software and the SDK (Software Developing Kit), with all the libraries needed to fast develop custom application.

Manuals and Datasheets

RIF: VUSB-DDK

DG5 Vhand 2.0 Bluetooth DDK:

The kit comprises:

1 DG5 Vhand 2.0 OEM

1 Bluetooth Kit (adaptor and battery)

1 CD containing all the software and the SDK (Software Developing Kit), with all the libraries needed to fast develop custom application.

Manuals and Datasheets

RIF: VBLUE-DDK

Software and Manuals Download:

The latest software and manual versions can be found here:

www.dg-tech.it/vhand/

Contacts

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