

Request #: HUTRR70
Title: Usages for Spatial Controllers
Spec Release: 1.12
Pages Affected: Generic Desktop 0x01
Received: 16 Dec 2016
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CurrentStatus: Approved
Priority: Normal
Submitted: 16 Dec 2016
Values checked: Yes, by Chair
Voting Starts: 3 Jan 2016
Voting Ends: 10 Jan 2016
Required Voter: Wacom
Required Voter: nVidia
Required Voter: Apple

Title: HUTRR70 Usages for Spatial Controllers

Summary:

We propose the addition of a collection usage and other supporting usages for handheld spatial controllers that users move freely through space to provide position and orientation input to the host OS.

Background:

Spatial controllers are adopting a set of standard controls, such as thumbsticks and triggers. These HID usages will allow hardware manufacturers to build controllers that communicate in a standard way and control functions with a uniform experience.

The Generic Desktop page today supports rotation using Euler angles (Rx/Ry/Rz). We are extending this to support quaternions as well (Qx/Qy/Qz/Qw).

Expressing a rotation as a quaternion avoids ambiguity about the order in which the host must apply the three axis rotations. Many applications also choose to use quaternions instead of Euler angles in their own logic to avoid gimbal lock. Surfacing quaternions directly to such apps from the device's firmware reduces precision loss caused by the conversion from Rx/Ry/Rz.

Proposal:

New usages to be added to Section 4, Table 6: Generic Desktop Page (0x01)

Usage ID	Usage Name	Usage Type
0F	Spatial Controller	CA
...	...	
49	Qx	DV
4A	Qy	DV
4B	Qz	DV
4C	Qw	DV
...	...	
94	Index Trigger	MC, DV
95	Palm Trigger	MC, DV
96	Thumbstick	CP

Update the Reserved section 0F-2F to be 10-2F.

Update the Reserved section 49-7F to be 4D-7F.

Update the Reserved section 94-9F to be 97-9F.

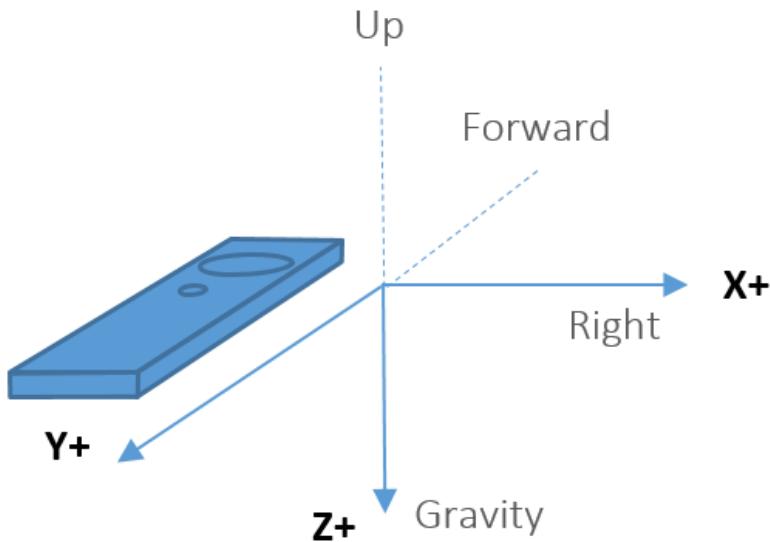
Usage Value check [performed by Chair] : Usage 0E was allocated in HUTRR62. Usage 0x48 was allocated in HUT 1.12. Usage 0x93 was allocated in HUT 1.12.

Descriptions:

Spatial Controller

A handheld input device that users move freely through space to provide position and orientation input. The spatial controller's orientation is represented as a rotation relative to its neutral orientation. The neutral orientation is the controller's orientation when sitting flat on a surface pointing forward along the negative Y axis, with gravity pointing down along the positive Z axis and with X increasing from the Controller's left to its right. The "forward" direction in the XY plane is unspecified and implementation-specific. This rotation is expressed as a unit quaternion ($Q_x/Q_y/Q_z/Q_w$).

If the Spatial Controller reports position in addition to orientation, the translation axes must correspond to the rotation axes.



Q_x – The X component of a unit quaternion, representing a rotation in space about a unit vector. Rotations represented by quaternion report values follow the right-hand rule.

Q_y – The Y component of a unit quaternion, representing a rotation in space about a unit vector. Rotations represented by quaternion report values follow the right-hand rule.

Q_z – The Z component of a unit quaternion, representing a rotation in space about a unit vector. Rotations represented by quaternion report values follow the right-hand rule.

Q_w – The W component of a unit quaternion, representing a rotation in space about a unit vector. Rotations represented by quaternion report values follow the right-hand rule.

Informative:

The Generic Desktop page today supports rotation using Euler angles (Rx/Ry/Rz). We are extending this to support quaternions as well (Qx/Qy/Qz/Qw).

Expressing a rotation as a quaternion avoids ambiguity about the order in which the host must apply the three axis rotations. Many applications also choose to use quaternions instead of Euler angles in their own logic to avoid gimbal lock. Surfacing quaternions directly to such apps from the device's firmware reduces precision loss caused by the conversion from Rx/Ry/Rz.

Index Trigger – The pressure applied to an input device's index-finger trigger, indicating that the user is pulling their index finger. This usage can be a DV for an analog trigger or an MC for a digital trigger.

Palm Trigger – The pressure applied to an input device's palm trigger, indicating that the user is closing their fist tightly around the controller. This usage can be a DV for an analog trigger or an MC for a digital trigger.

Thumbstick – An input device's two-axis thumb-operated control stick. The thumbstick's X value increases from left to right and its Y value increases from bottom to top. A thumbstick is typically a rotational motion sensor. However, for legacy reasons, it is defined using linear axes.

Notes on Approval Procedure:

HID WG On Line Voting Procedures

1. Votes are on a per company basis.
2. Each Review Request shall have attached a Required Voter List that is the result of recruiting by the HID Chair and submitter of members of the USB IF. Required Voter List must include the HID Chair plus 2 companies (other than the submitter) plus any others designated by the HID Chair at the Chair's discretion. The Required Voter List ensures that a quorum is available to approve the Request.
3. Impose a 7-calendar-day posting time limit for new Review Requests. HID Chair or designate must post the RR within 7 calendar days. HID Chair or designate must work with the submitter to make sure the request is valid prior to posting. Valid review request must include all fields marked as required in the template. A new template will be adopted that requires at least the following fields: Change Text, Required Voter List, Review Period End Date and Voting End Date, Submittal Date, Submitter, Review Request Title and RR Number.
4. If a RR approval process stalls, the HID Chair may call a face-to-face meeting or conference call to decide the issue. Submitter may request that this take place.
5. Impose a minimum 15-calendar-day review period on a posted RR prior to the voting period. At HID Chair discretion, changes to the RR may require this review period to restart.
6. The Chair will accept votes via documentable means such as mail or e-mail during the 7 calendar days after the close of the review period. If a Required Voter does not vote during the period, then there is no quorum and the Chair may pursue the absent required voter and extend the voting period. The Chair may designate a substitute for the absent voter and extend the voting period if necessary.