Abstract Description of Gestures

[Echtler, Klinker, Butz @ HC 2010]

Regions:
spatial areas defined in reference coordinate system
extension of „traditional“ desktop UI window objects

Gestures:
sequences of features, either …
pre-defined by capability description or …
customized by application

Features:
geometrical/mathematical properties of input data, e.g.:
motion vector
relative rotation
travelled path

further classification through filters/constraint values
Putting it together
Putting it together

2 objects (= fingers)
Putting it together

motion vector

2 objects (= fingers)
GISpL: Gestural Interface Specification Language

[Echtler, Butz @ TEI 2012]

```
{
    "name":"2FingerFlickTopRight",
    "flags":"oneshot",
    "filters":2046,
    "duration":[50],
    "features":[
        {
            "type":"Count",
            "constraints":[2,2]
        },
        {
            "type":"Motion",
            "constraints":[
                [0.2,0.2,0.1],
                [0.1,0.1,-0.1]
            ]
        }
    ]
}
```

- **Flags**: gesture modifiers
  - oneshot → triggered only once
  - default → stored as reusable definition
  - sticky → „sticks“ to starting region

- **Filters**: bitmask for TUIO 2.0 types
  - 2046 = all fingers

- **Duration**: how far to look back in history

- **Type**: class of feature

- **Constraints**: limits for feature values

JSON format – universally readable
GISpL: Summary

simple example: „rotate“ gesture contains one feature: relative rotation

result value generated through...
- multi-finger rotation or
- object rotation or
- mouse wheel or ...

mapping is hardware-dependent part of capability description
→ application developer doesn't have to care
What is a gesture?

„A motion of the limbs or body, especially one made to emphasize speech.“
[Merriam-Webster 2012]

↓

„A motion of the limbs or body, performed to trigger an action.“

Gestures are not only …

multi-touch or shape-/mark-based gestures or body-tracking or …

What do they have in common?
**Gesture Interpretation**  
[Echtler, Klinker @ AVI 2008]

*What is a gesture?*
→ „A motion of the limbs or body...“
→ *How can these motions be represented?*

Core concepts for unified approach:

- **Regions:** spatial areas containing gesture sets
- **Gestures:** representations for user actions
- **Features:** „atomic“ building blocks for gestures
## Available Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motion</td>
<td>multitouch-inspired</td>
</tr>
<tr>
<td>Rotation</td>
<td></td>
</tr>
<tr>
<td>Scale</td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>strokes/shapes</td>
</tr>
<tr>
<td>Path</td>
<td></td>
</tr>
<tr>
<td>ID</td>
<td>tangibles, whole-body interaction</td>
</tr>
<tr>
<td>ParentID</td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td></td>
</tr>
<tr>
<td>Position</td>
<td>position &amp; object shape</td>
</tr>
<tr>
<td>Dimensions</td>
<td></td>
</tr>
</tbody>
</table>
Architectural Details

Input Events (TUIO)

GISpL Interpreter

Regions → Features → Gestures

Regions 1

Features → Gestures

Features 2

Gestures Definitions

Gestures Events

Gestures Presets

Application

Input Objects

Beneath the Surface - Dr. Florian Echtler
Guess the Gesture

{
    "name":"what_am_i",
    "flags":"oneshot",
    "filters":8192,
    "features":[
        { "type":"Count", "constraints":[0,0], "duration":[150,100] },
        { "type":"Count", "constraints":[1,1], "duration":[100, 50] },
        { "type":"Count", "constraints":[0,0], "duration":[ 50,  1] },
        { "type":"Count", "constraints":[1,1], "duration":[  0,  0] }
    ]
}

(start of history)

| ... | 150 | 100 | 50 | 0 (now) |
CollabDraw Quit Gesture
[Morris et al. @ IEEE CGA 2006]

```json
{
    "name": "quit_application",
    "flags": "oneshot",
    "filters": 2,
    "features": [
        { "type": "ID", "constraints": [1,1] },
        { "type": "ID", "constraints": [2,2] },
        { "type": "ID", "constraints": [3,3] },
        { "type": "ID", "constraints": [4,4] },
        { "type": "Count", "constraints": [4,4] },
        { "type": "Group", "constraints": [0,0.01] }
    ]
}
```
Work-In-Progress: „ubiquitous“ gestures

Problem: gestures...
  defined on, e.g., screen background...
  but intended for smaller sub-regions
example: strike-through gesture
possible solution: „ubiquitous“ flag
gesture will be delivered to all participating regions