Webcam based games

Aurelijus Banelis
Aurelijus Banelis
Software developer
aurelijus.banelis.lt
aurelijus@banelis.lt

GPG public key    rsa2048/539B6203
Key fingerprint = 130D C446 1F1A 2E50 D6E3
3DA8 3202 05E7 539B 6203
<table>
<thead>
<tr>
<th>WHAT</th>
<th>Introduction, what are WebCam based games</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOW</td>
<td>Implementation details, how does it work</td>
</tr>
<tr>
<td>WHEN</td>
<td>Tips from practice, when to use</td>
</tr>
<tr>
<td>WHAT</td>
<td>Implementation details, how does it work</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>HOW</td>
<td>Introduction, what are WebCam based games</td>
</tr>
<tr>
<td>WHEN</td>
<td>Tips from practice, when to use</td>
</tr>
</tbody>
</table>
WebCam based games are unique, because you can:

Control your game without keyboard or mouse

Instead: using movement, special objects or other visual techniques
DEMO

Replacing traditional input devices

- Click on flying object
- Buttons-like interactive areas
- Scrollbars-like interactive areas
DEMO

Results of interaction

- Draw on top of camera view
- Manipulate WebCam output
- Change external visualisation
WHAT
WebCam as motion input device

HOW
Implementation details, how does it work

WHEN
Tips from practice, when to use
<table>
<thead>
<tr>
<th>WHAT</th>
<th>WebCam as motion input device</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOW</td>
<td>Implementation details, how does it work</td>
</tr>
<tr>
<td>WHEN</td>
<td>Tips from practice, when to use</td>
</tr>
</tbody>
</table>
Based on computer vision library OpenCV

```c
#include <opencv/cv.h>

frame = cvQueryFrame(capture);

for(int x = 0; x < frame->width; x+=step) {
  for(int y = 0; y < frame->height; y+=step) {
    differences[x + y*frame->width] =
      abs(CV_R(frame, x, y) - CV_R(oldFrame, x, y)) +
      abs(CV_G(frame, x, y) - CV_G(oldFrame, x, y)) +
      abs(CV_B(frame, x, y) - CV_B(oldFrame, x, y));
  }
}
```

DEMO

Debugging camera data

- Analysing current frame
- Comparing 2 frames
- Comparing history of input data
Precision and noise
It is all about the light

- Recognising color/shape vs changes
- Low light, white balance, shadows
**WHAT**

WebCam as motion input device

**HOW**

OpenCV for retrieval and analysis of each frame

**WHEN**

Tips from practice, when to use
<table>
<thead>
<tr>
<th>WHAT</th>
<th>WebCam as motion input device</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOW</td>
<td>OpenCV for retrieval and analysis of each frame</td>
</tr>
<tr>
<td>WHEN</td>
<td>Tips from practice, when to use</td>
</tr>
</tbody>
</table>
Webcam not mainstream

- Fun to learn OpenCV via games but...
- Versus: Kinect, wii, PS move
- Responsive in all environments
Controlled environment

- Example: Advertise in a conference
- Close to light source, solid background
- Visuals/games specific to the audience
It is still the game

- Make it fun: scores, challenges, levels...
- Guide the player: intro video, reminders
- Balance: Usable vs unique
<table>
<thead>
<tr>
<th>WHAT</th>
<th>WebCam as motion input device</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOW</td>
<td>OpenCV for retrieval and analysis of each frame</td>
</tr>
<tr>
<td>WHEN</td>
<td>Own the light, keep it fun, use as advertisement</td>
</tr>
</tbody>
</table>
Webcam based games

Fork and use it in your community

git clone git@github.com:aurelijusb/webcam-games.git
Questions?

Webcam-based games

Aurelijus Banelis
References

- http://opencv.org/
- https://github.com/aurelijusb/webcam-games
- https://aurelijus.banelis.lt
- https://www.youtube.com/watch?v=PjPkiJQDdaU
- https://fosdem.org