3D Display of Motion Capture Data Using Flash

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Self Introduction

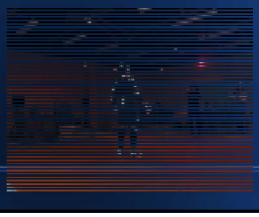
- I'm a Graphic Designer from “Universidad Iberoamericana A.C.” university in Mexico.
- For the last 6 years I've been working on web pages design and online applications design and development.
- I came to Japan thanks to JICA (Japanese International Cooperation Agency), with the JICA-Mexico Exchange Program.
- The reason I came to Japan was to expand my knowledge, learn the “Know How”, evaluate technologies and procedures to apply in future work.

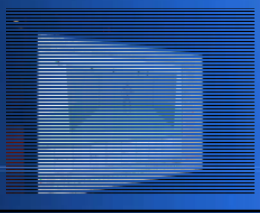
General Objectives

- Make the Motion Capture (MoCap) database available to anyone over the internet.
  - Japanese traditional dance.
  - Performances.
  - Sports movement, etc.
- Create User's restrictions for copy righted data.
- Make a web based Motion Capture file retrieval system.
- Deliver a 3D animation of the selected Motion Capture file.
- Use of Flash for displaying the 3D animation.

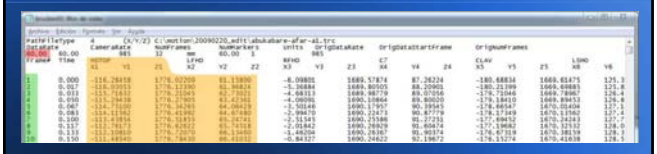
MoCap Session

- MoCap consist on adding markers to a real person and record his movement over a lapse of time.
- With special cameras (16 on this case) and software, the movement is recorded by capturing the XYZ position of every marker.





MoCap Data



- The MoCap format file used is TRC data format.
- Data is recorded with a Frame Rate previously established. This number states the number of frames per second.
- Also records the number of markers and the XYZ position of each one at any given frame over the duration of the recording.

Sharing the Mocap database

- The MoCap data could easily be used to generate movies like AVI's, MP4's or Flash Video but with some disadvantages:
  - Every movie should be created in advance.
  - Heavy data weight for storage.
  - Heavy data weight for downloading.
  - No interaction.
  - Only one point of view recorded.

The Use of Flash

- Flash is well known for delivering low weight animations, and also offers some advantages:
  - With Action Script 3 [2], it can add user's interaction.
  - Can run on almost any browser and device.
  - Can read external files to use within.
- But also presents some disadvantages:
  - It's a 2D program with only X and Y axis.
  - 3D is simulated, usually with pre-rendered animation or with the use of layers.

The Use of Papervision 3D [1]

- Papervision 3D is an open source library based on Action Script 3 to use with Flash [3].
- It lets Flash (a 2D software) create an manipulate actual 3D objects and environments.
- Extends the capabilities of Flash to deliver and render 3D animations in real time. Unlike other softwares that offer pre-rendered animations only.

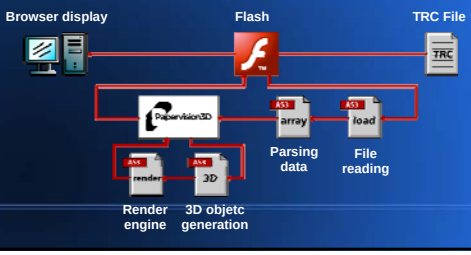
Flash & Papervision 3D

- Use only an X and Y axis.
- Simulates 3D bringing objects to the front or the back.

- Uses X, Y and Z axis.
- Can set cameras, objects, materials, lights and render.

Flash & Papervision 3D

- Use object oriented programming structure.
- Use classes as the main structure with external ActionScript files instead of embedded code.

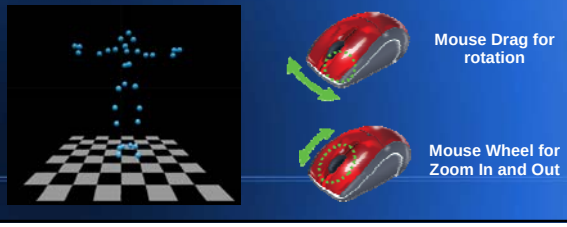


Security

- Instead of using code inside the Flash file, we created external Actions Script files to prevent the de-compilation of the SWF to access data.
- By default, Flash Player uses a Security Sandbox which allows the player to access local file but prevents communication in any other way.
- This assures the users that local data cannot be leaked out or inappropriately shared.

Final Result

- The final result comes with a 3D animation generated by using the MoCap data.
- It renders every frame of the data and every update of the mouse interaction.



Conclusions & Future Work

- The integration of technologies offered a very good data manipulation, a good level of interactivity, and offers a very powerful delivery, manipulation and generation of 3D animations and environments.
- Future work may improve the user interface and interaction.
- This work only deals with TRC MoCap file format, future works may include other file formats.
- The data security could be improved on future works.

References

- *[1] Papervision 3D Essentials*. TOUNDER, Paul. WINDER, Jeff. 1st edition. Birmingham, UK, 2009.
- *[2] Programming ActionsScript 3.0.* Adobe Systems Incorporated. San Jose, California, USA, 2007.

[3] **海賀 孝明 ほか,**
モーションキャプチャデータ公開のためのFlashを利用した3Dビューアの開発 (Development of a 3D viewer using flash technique for opening motion capturing data to the public)
電子情報通信学会技術研究報告 109(160), 75-80, 2009-07-30