Collaborative 3D Model Viewing on the Web First Review

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Overview

At a Glance

Why Collaborative 3D Model Viewing?

- Teaching and learning from 3D models more comprehensive than from 2D drawing
- Access to real objects costly or limited
- Collaborative viewing allows new, interactive learning methods

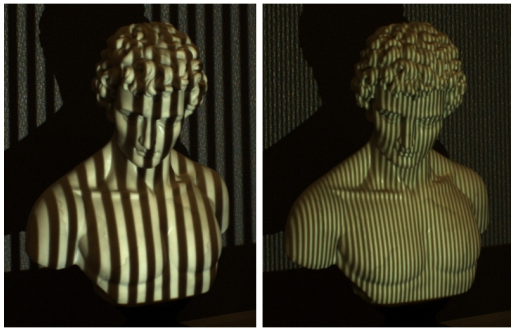
Our Approach

- Upload models (especially from 3D scanning) into a database
- View models in a browser on different devices
- Manipulate view on all devices at the same time

Technology Survey - Digitization of Physical Objects

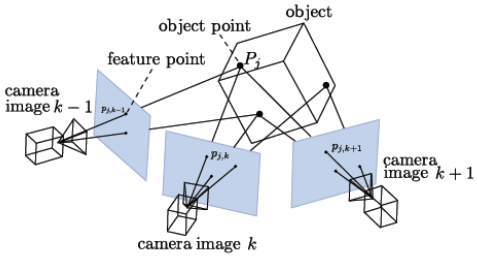
White Light Scanner

- Allows digitization of small objects
- Scanning process requires user interaction
- As accurate as a laser scanner



Structure From Motion

- Creates 3-D models from videos!
- Utilizes modern computer vision techniques
- No user interaction necessary
- Output is not nearly accurate as WLS



Technology Survey - Image and Model Data Storage

Database - To Embrace or Avoid?

- Model files are generally massive
- Indexing them is not trivial
- ACID (Atomicity, Consistency, Isolation, Durability)
- Authorization

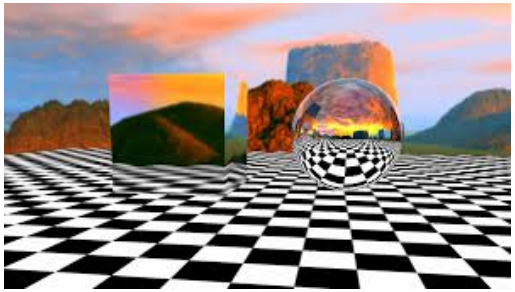
Candidates

- MongoDB
- PostgreSQL
- MySQL

Technology Survey - 3D Data Presentation

Criteria

- Supports common 3-D data formats
- Allows user to apply affine transformations
- Exposes internal state to the browser
- Final product is not dependent on an add-on.



Candidates

- Three.js
- O3D
- X3Dom

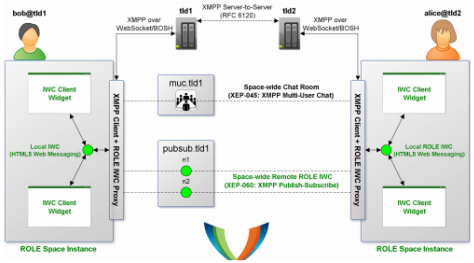
Technology Survey - Cross-Browser Communication

Role SDK

- Open source e-learning environment
- Personalized with widgets
- Any web-application is convertible to a widget with some preamble
- Provides multi-user interaction

Inter-Widget Communication System

- Defined as part of the preamble
- Communicates with other add-ons in the same space
- Publishes events to all active users in the same learning space



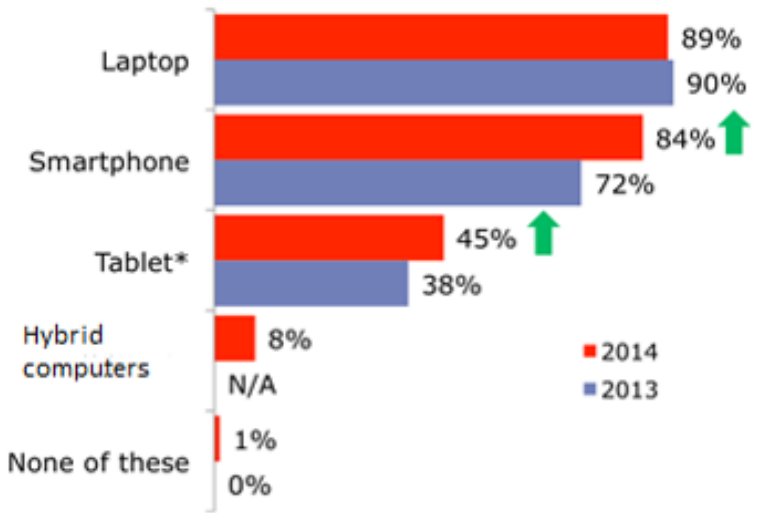
Market analysis

Industrial Diversity

- Medical industry, Architecture, Computer Graphics, TV, movies, video games.
- Educational sector.

Wide User base

- Everyone with a mobile device or desktop computer that supports the used technology.
- 75% of desktop computers and 50% of mobile devices are equipped with WebGL-enabled browsers.



Market analysis

Industry cost structure

- Scanning equipment is expensive, but will become more affordable.
- Standardized web technologies and SDKs.

Distribution Channels

- Medical Faculty at RWTH Aachen.
- Expand to more medical faculties in Germany and broaden the scope of application.

Key Success Factors

- Adjust to new technology/developments.
- Abilities in programming.
- Building reputation.

Gantt Chart

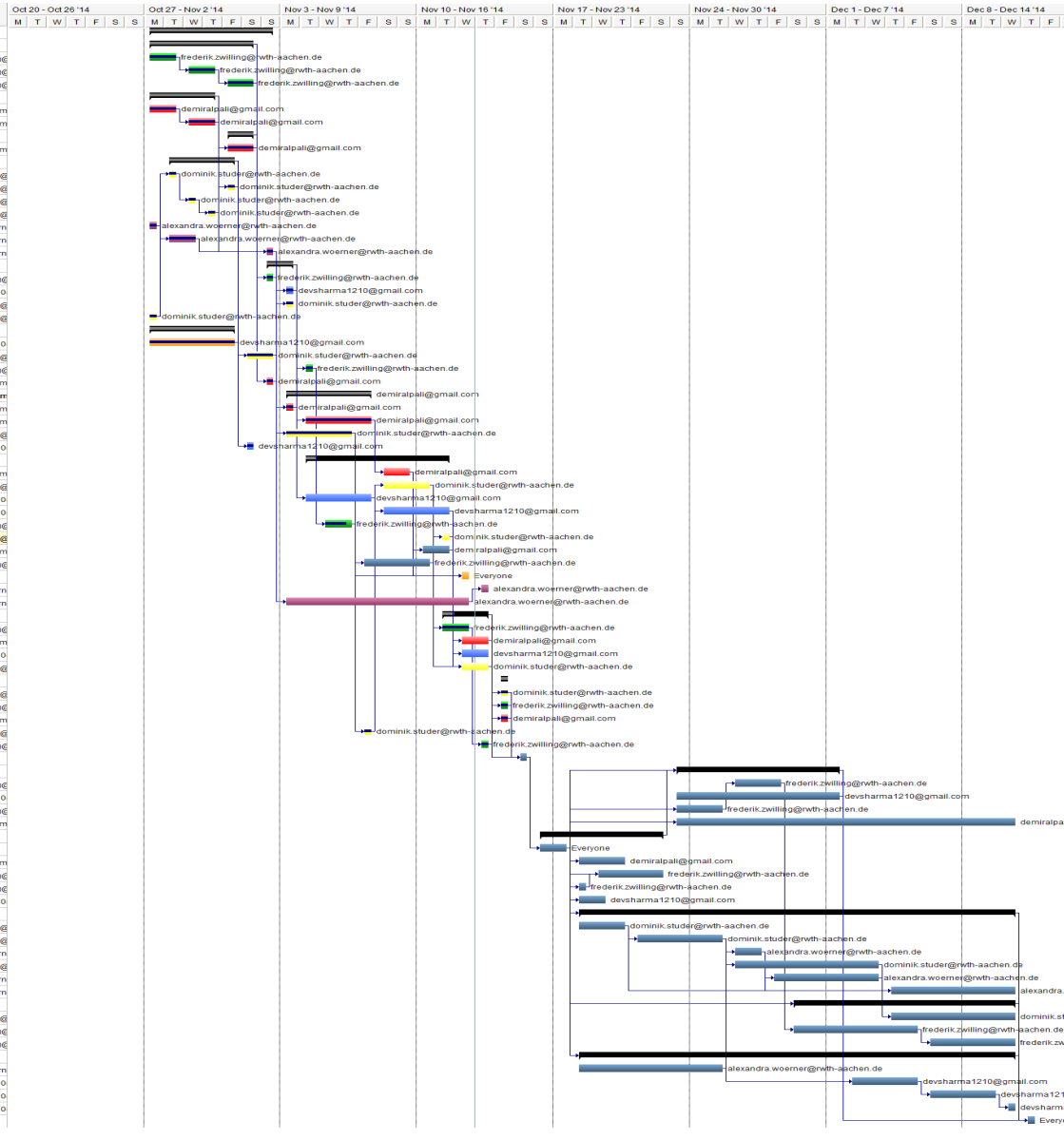
A Gantt chart is a bar chart that shows the tasks of a project, when each task must take place and how long each will take.

Conventions

- Try to keep it simple.
- Highlight milestones/reviews.
- Assign different colours to team members .
- Indicate the (temporal) dependency of one task from another with arrows.

Gantt Chart

	Name	Duration	Start	Finish	Predecessors	Resources
1	**Definition of Done**	**7d**	**27/10/2014**	**02/11/2014**		
2	**Source Control / Continuous Integration**	**6d**	**27/10/2014**	**01/11/2014**		
3	git branching	2d	27/10/2014	28/10/2014		frederik.zwilling@
4	git commit messages	2d	29/10/2014	30/10/2014	3	frederik.zwilling@
5	git pull requests	2d	31/10/2014	01/11/2014	4	frederik.zwilling@
6	**Code Style**	**4d**	**27/10/2014**	**30/10/2014**		
7	HTML 5	2d	27/10/2014	28/10/2014		demiralpali@gm
8	JavaScript	2d	29/10/2014	30/10/2014	7	demiralpali@gm
9	**Documentation**	**2d**	**31/10/2014**	**01/11/2014**		
10	How a documentation should look like	2d	31/10/2014	01/11/2014	8	demiralpali@gm
11	**Testing**	**4d**	**28/10/2014**	**31/10/2014**		
12	test process	1d	28/10/2014	28/10/2014	23	dominik.studer@
13	tools for performance / memory usage (per browser/device	1d	31/10/2014	31/10/2014	15	dominik.studer@
14	test script template	1d	29/10/2014	29/10/2014	12	dominik.studer@
15	test log template	1d	30/10/2014	30/10/2014	14	dominik.studer@
16	Code fulfills task	1d	27/10/2014	27/10/2014		alexandra.woern
17	Gant Chart	2d	28/10/2014	29/10/2014	16	alexandra.woern
18	Merge / TEX document parts	1d	02/11/2014	02/11/2014	2,6,9,11,17	alexandra.woern
19	**Product Backlog**	**2d**	**02/11/2014**	**03/11/2014**		
20	prioritize	1d	02/11/2014	02/11/2014	5	frederik.zwilling@
21	refine	1d	03/11/2014	03/11/2014	20	devsharma1210
22	Upload documents	1d	03/11/2014	03/11/2014	18	dominik.studer@
23	Create Gantt Chart	1d	27/10/2014	27/10/2014		dominik.studer@
24	**Literature Survey**	**5d**	**27/10/2014**	**31/10/2014**		
25	MeshLab	5d	27/10/2014	31/10/2014		devsharma1210
26	Single User Story	2d	01/11/2014	02/11/2014	13	dominik.studer@
27	Review Backlog	1d	04/11/2014	04/11/2014	19	frederik.zwilling@
28	Review Definition of Done	1d	02/11/2014	02/11/2014	10	demiralpali@gm
29	**Role SDK Model Viewer**	**5d**	**03/11/2014**	**07/11/2014**		**demiralpali@gm**
30	Wrap Role SDK	1d	03/11/2014	03/11/2014	28	demiralpali@gm
31	Inter Widget Communication Example	4d	04/11/2014	07/11/2014	30	demiralpali@gm
32	Repository	4d	03/11/2014	06/11/2014	26	dominik.studer@
33	Update Gantt Chart	1d	01/11/2014	01/11/2014	25	devsharma1210
34	**Tech Survey**	**8d**	**04/11/2014**	**11/11/2014**		
35	Open 3D vs X3D	2d	08/11/2014	09/11/2014	31	demiralpali@gm
36	Storage / Repository / Database	3d	08/11/2014	10/11/2014	55	dominik.studer@
37	Conversion to X3D	4d	04/11/2014	07/11/2014	21	devsharma1210
38	Automatic Downsampling	4d	08/11/2014	11/11/2014	37	devsharma1210
39	ROLE SDK	2d	05/11/2014	06/11/2014	27	frederik.zwilling@
40	**"Pipeline" / "Architecture" Overview**	**1d**	**11/11/2014**	**11/11/2014**	**36**	**dominik.studer@**
41	White light scanning	2d	10/11/2014	11/11/2014	35	demiralpali@gm
42	Structure From Motion	4d	07/11/2014	10/11/2014	39	frederik.zwilling@
43	Definition of Done Technology Part	1d	12/11/2014	12/11/2014	35,36,37,38,39,4	Everyone
44	Reflection Text	1d	13/11/2014	13/11/2014	45	alexandra.woern
45	Market Analysis	10d	03/11/2014	12/11/2014	18	alexandra.woern
46	**Presentation**	**3d**	**11/11/2014**	**13/11/2014**		
47	Overview, Objectives	2d	11/11/2014	12/11/2014	42	frederik.zwilling@
48	Technologies	2d	12/11/2014	13/11/2014	41	demiralpali@gm
49	Market, Gantt	2d	12/11/2014	13/11/2014	38	devsharma1210
50	Scrum, Conclusion, Demo	2d	12/11/2014	13/11/2014	36,40	dominik.studer@
51	**Running skeleton**	**1d**	**14/11/2014**	**14/11/2014**		
52	Integrate DB, single view	1d	14/11/2014	14/11/2014	50	dominik.studer@
53	Create overview	1d	14/11/2014	14/11/2014	56	frederik.zwilling@
54	Integrate DB, overview	1d	14/11/2014	14/11/2014	48	demiralpali@gm
55	Update Gantt	1d	07/11/2014	07/11/2014	32	dominik.studer@
56	Update Product Backlog	1d	13/11/2014	13/11/2014	47	frederik.zwilling@
57	Review Meeting	1d?	15/11/2014	15/11/2014	46,52,53,54	
58	**Improve Layout**	**9d?**	**23/11/2014**	**01/12/2014**	**63,64**	
59	"Back" button	3d?	26/11/2014	28/11/2014	61	frederik.zwilling@
60	Improve visual appearance	9d?	23/11/2014	01/12/2014		devsharma1210
61	Direct link to 3D models	3d?	23/11/2014	25/11/2014	63,64	frederik.zwilling@
62	Inter-device communication	18d?	23/11/2014	10/12/2014	63,64	demiralpali@gm
63	**Improve code quality**	**7d?**	**16/11/2014**	**22/11/2014**		
64	Improve file structure	2d?	16/11/2014	17/11/2014	57	Everyone
65	Improve single view code	3d?	18/11/2014	20/11/2014	64	demiralpali@gm
66	Improve overview page code	4d?	19/11/2014	22/11/2014	64,67	frederik.zwilling@
67	Separate JavaScript code	1d?	18/11/2014	18/11/2014	64	frederik.zwilling@
68	Use CSS	2d?	18/11/2014	19/11/2014	64	devsharma1210
69	**Prototype for uploading models**	**23d?**	**18/11/2014**	**10/12/2014**	**64**	
70	Frontend select file	3d?	18/11/2014	20/11/2014		dominik.studer@
71	Upload file to filesystem	5d?	21/11/2014	25/11/2014	70	dominik.studer@
72	Writing meta data (URL to file) to database	2d?	26/11/2014	27/11/2014	81	alexandra.woern
73	Validation of uploaded file	8d?	26/11/2014	03/12/2014	71	dominik.studer@
74	Input validation for metadata	6d?	28/11/2014	03/12/2014	72	alexandra.woern
75	Testing	7d?	04/12/2014	10/12/2014	70,71,72,73,74	alexandra.woern
76	**Testing on different devices/browser**	**12d?**	**29/11/2014**	**10/12/2014**	**64**	
77	Compatibility with browsers	7d?	04/12/2014	10/12/2014	73	dominik.studer@
78	Compatibility with devices (tablet/smartphone)	7d?	29/11/2014	05/12/2014	59	frederik.zwilling@
79	Survey of usability problems on tablets / smartphones	5d?	06/12/2014	10/12/2014	78	frederik.zwilling@
80	**Scanning of skull**	**23d?**	**18/11/2014**	**10/12/2014**	**64**	
81	Using SmartScan (doing the white light scan)	8d?	18/11/2014	25/11/2014		alexandra.woern
82	Approximation of model (fill holes)	4d?	02/12/2014	05/12/2014	60,81	devsharma1210
83	Downsizing	4d?	06/12/2014	09/12/2014	82	devsharma1210
84	Conversion	1d?	10/12/2014	10/12/2014	83	devsharma1210
85	Presentation Slides	1d?	11/12/2014	11/12/2014	58,69,76,80	Everyone



Scrum

Customer contact

- 3 Customer meetings in first 2 weeks
- Mail

Collaborative working

- Sprint Planning
- Daily Scrum: 1x each week
- Sprint Review: Customer currently not available
- Sprint Retrospective: To be introduced

Reflection on team process

Team member

- Evaluation of skills and preferences
- Distribution of roles

Communication

- Meetings, Facebook
- Sharing results of technology survey: mailing list

Collaborative working

- Product Backlog, DoD, Market Analysis, ..: Google Drive
- Protocols of customer meetings

Demo of current prototype

Conclusion and next steps

Conclusion

- **Collaborative viewing of 3D models**
- **Access to limited objects, new learing methods**
- **The educational sector and many industries offer great potential and profitability for usage of 3D models.**

Next Steps

- Talking with the customer
- Interface for uploading models
- Inter-device-communication
- Layout prototype