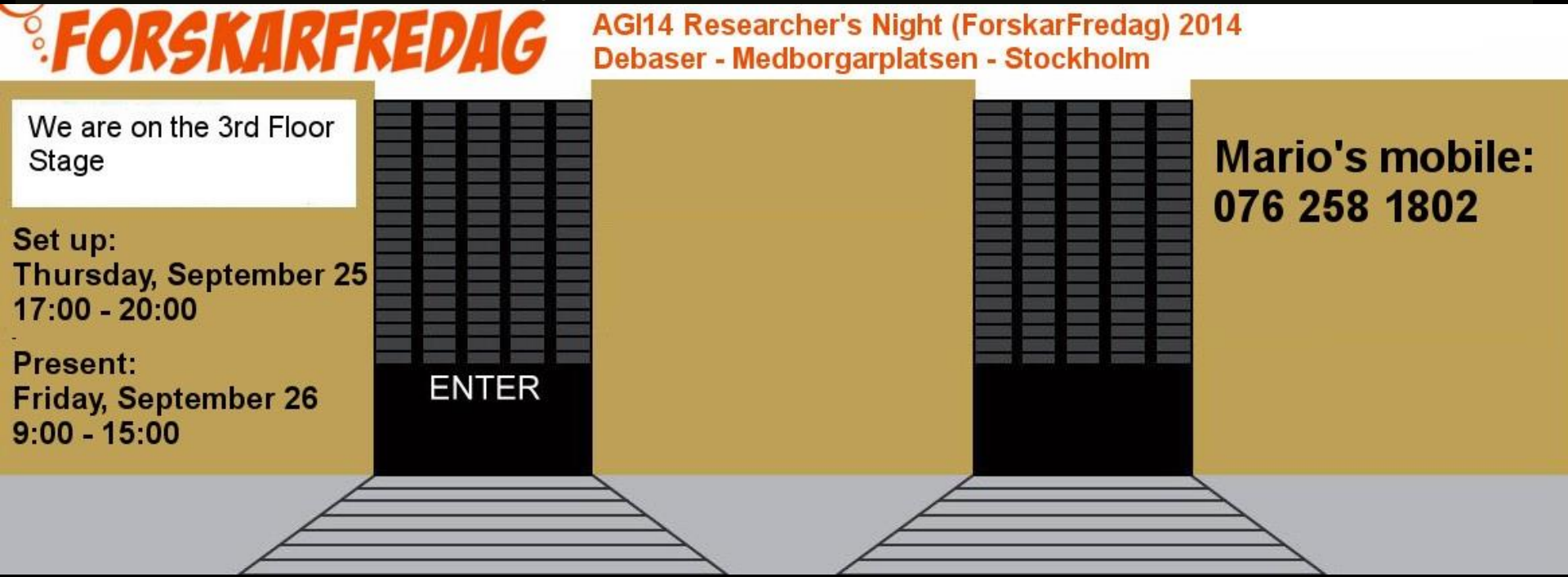
Advanced Graphics and Interaction 2014: Lecture 7



Mario Romero
2014/09/18

KTH VETENSKAP OCH KONST

VICSTHLM
VISUALISATION INTERACTION COLLABORATION

Course Schedule

1.	Wed Sept 03 13-15	Lecture 1	Intro
2.	Fri Sept 05 15-19	Lectures 2-3	Group Formation and brainstorming
3.	Wed Sept 10 13-15	Lecture 4	Proposals
4.	Thu Sept 11 10-12	Lecture 5	Feedback on proposals
5.	Mon Sept 15 8:30-10	Lecture 6	Hello World! Demos
6.	**Thu Sept 18 10-12**	**Lecture 7**	**Demo Day and ForskarFredag Planning**
7.	Wed Sept 24 14-16	Lecture 8	Demo Day!!!
•	Thu Sept 25 16-20	Debaser Invation	Setup 16:00 – 20:00
•	Fri Sept 26 8-18	Debaser Domination	ForskarFredag 2014!!!
8.	Mon Sept 29 8-10	Lecture 9	Reflections of ForskarFredag
9.	Wed Oct 8 13-15	Lecture 10	Agile Development → ComiCon
10.	Mon Oct 13 8-10	Lecture 11	Agile Development 2
11.	Wed Oct 15 13-15	Lecture 12	Aglie Development 3
•	Wed Oct 29 16-23	Kista Mässan Invation	Setup 16:00 – 23:59
•	Thu Oct 30 -Sun Nov 2, 9-19	Kistamässan Domination	COMICON 2014!!!
12.	Tue Nov 4 10-12	Lecture 13	Reflections on ComiCon
13.	Wed Nov 5 10-12	Lecture 14	New groups
14.	Fri Nov 7 15-19	Lectures 15-16	Epson Moverio Workshop
15.	Tue Nov 11 10-12	Lecture 17	Proposals
16.	Tue Nov 18 10-12	Lecture 18	Feedback on proposals. Early hello world dem os
17.	Tue Nov 25 10-12	Lecture 19	Hello world !demos
18.	Tue Dec 2 10-12	Lecture 20	Demo Day!!!
19.	Thu Dec 4 15-18	VIC Invation	Prepare Open House
20.	Fri Dec 5 15-19	Open House	AGI14-VIC Open House

Agenda

1. Updates?
2. Introduce Pierre - TA
3. Introduce Anton - Inventor
4. Plan Demo Day
5. Plan ForskarFredag
6. Group Meetings
7. One-on-one meetings

Updates

- What works now?
- What will work in a week?
- What didn’t work?
- What will not work in a week?
- What are the obstacles in your way?

Pierre Neidhardt

Teaching Assistant

pe.neidhardt@googlemail.com

Help you coordinate, acquire, run, execute, present, poster print, compile, transport, manage, update, communicate, lead, learn, film, photograph, interview, update, discuss, critique

Anton Osika

- Inventor
- Simple HUD 4 phone
- Demo
  - Javascript
  - 3JS
  - WebGL
  - Goo Technologies
  - Argon Browser
- anton.osika@gmail.com

Demo: Purpose

- Demonstrate working projects
- Interact with each other's projects
- Discuss
- Improve
- BUT…
  - Train to:
    - Present in 60 seconds to six-year-olds
    - Observe and gather formative evaluation quantitative and qualitative data in the field
    - Ellicit constructive criticism

Demo: Schedule

1. Pod Racer 10:15

Context switch 10:35

2. Space Survival 10:40

Context switch 11:00

3. Survival in the Dark 11:15

Context switch 11:35

4. YA3 11:40

Demo: Structure

- Technical Presentation 05:00
- Interactive Demo 15:00
  - Hands-on
  - Non team members
  - As many as possible
  - Discussion going on
- Context Switch 05:00

Demo: Roles

- At least:
  - One presenter
    - Present script only
    - Answer questions
  - One observer
    - Take notes
    - DO NOT TALK
  - One inquirer
    - Ask clarifying questions
    - Do not ask leading questions

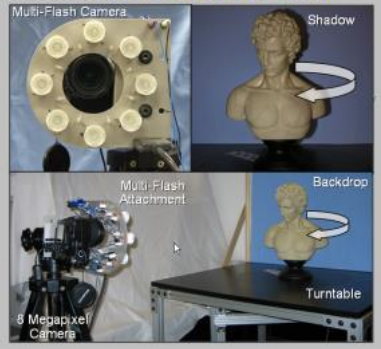
Demo: Presentation on Poster

- One slide
- 2, 3 or 4 columns
  - Motivation and Goals
  - Methods
  - Results
- Few words many images
- Link to how to do and present posters

Multi-Flash 3D Photography: Capturing the Shape and Appearance of 3D Objects

A new approach for reconstructing 3D objects using shadows cast by depth discontinuities, as detected by a multi-flash camera. Unlike existing stereo vision algorithms, this method works *even with plain surfaces*, including unpainted ceramics and architecture.

Data Capture: A turntable and a digital camera are used to acquire data from 670 viewpoints. For each viewpoint, we capture a set of images using illumination from four different flashes. Future embodiments will include a small, inexpensive handheld multi-flash camera.



Multi-Flash Turntable Sequence: Input Image	Estimated Shape: 3D Point Cloud	Recovered Appearance: Phong BRDF Model

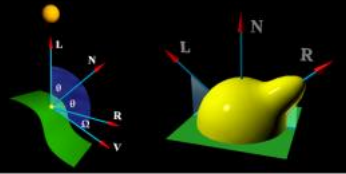
Recovering a Smooth Surface

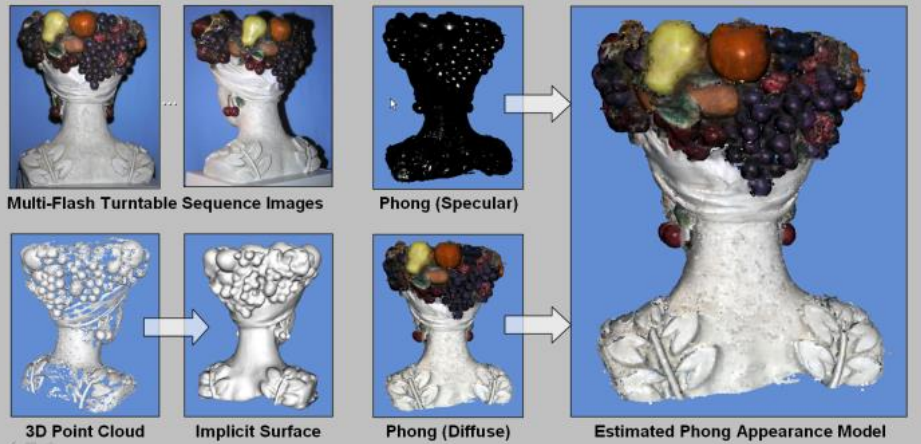
The reconstructed point cloud can possess errors, including gaps and noise. To minimize these effects, we find an implicit surface which interpolates the 3D points. This method can be applied to any 3D point cloud, including those generated by laser scanners.

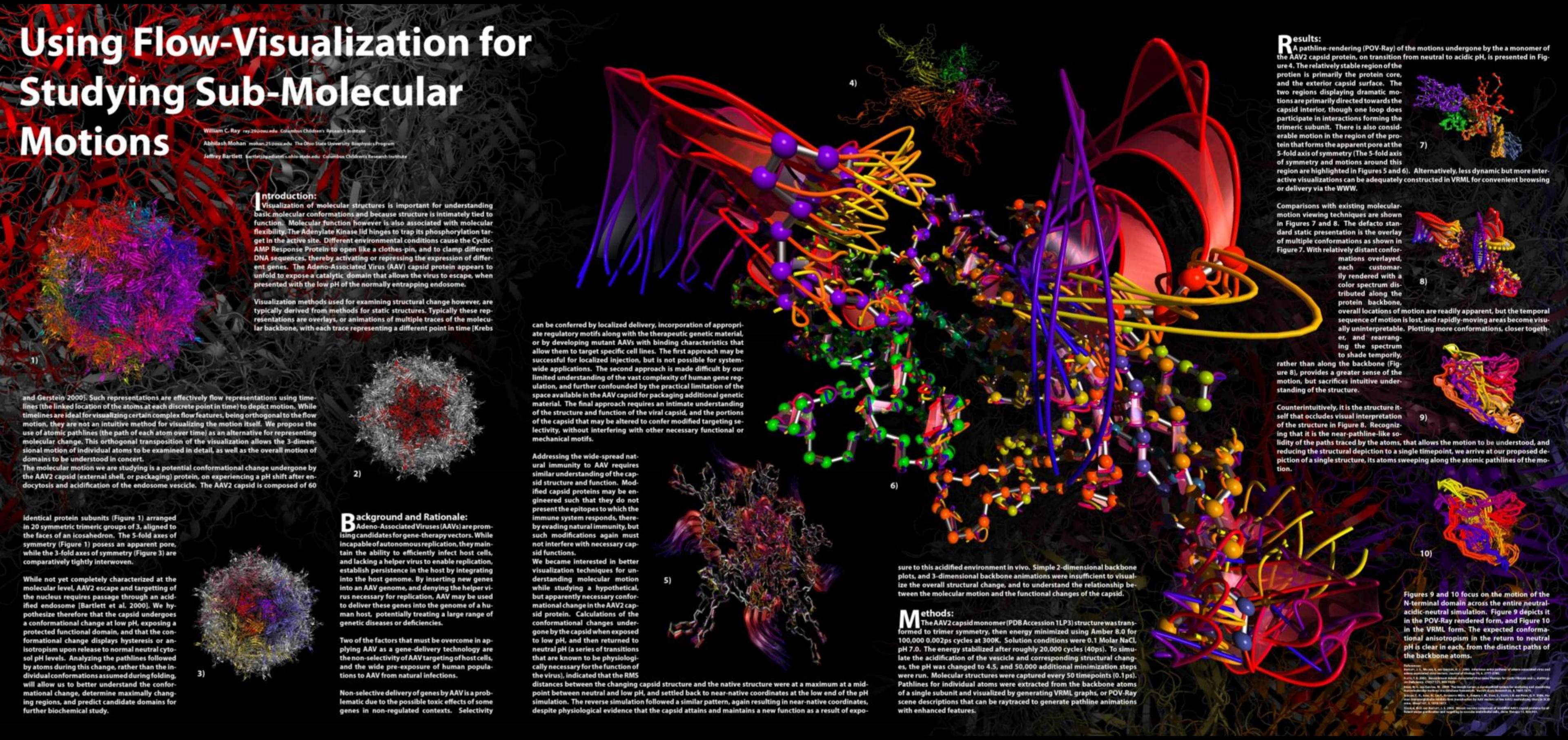
Photometric Reconstruction

Using the implicit surface, we can determine which points are visible from each viewpoint. To model the material properties of the surface, we fit a per-point Phong BRDF model to the set of visible reflectance observations (using a total of 67 viewpoints).

$$I_\lambda = \underbrace{k_{a\lambda}}_{\text{Ambient}} + \underbrace{k_{d\lambda}\mathbf{n}\cdot\mathbf{l}}_{\text{Diffuse}} + \underbrace{k_{s\lambda}(\mathbf{r}\cdot\mathbf{v})^n}_{\text{Specular}}$$







Using Flow-Visualization for Studying Sub-Molecular Motions

William C. Ray Columbus Children's Research Institute
Abhilash Mohan The Ohio State University Biophysics Program
Jeffray Bartlett Columbus Children's Research Institute

Introduction:

Visualization of molecular structures is important for understanding basic molecular conformations and because structure is intimately tied to function. Molecular function however is also associated with molecular flexibility. The Adenylate Kinase lid hinges to trap its phosphorylation target in the active site. Different environmental conditions cause the Cyclic-AMP Response Protein to open like a clothes-pin, and to clamp different DNA sequences, thereby activating or repressing the expression of different genes. The Adeno-Associated Virus (AAV) capsid protein appears to unfold to expose a catalytic domain that allows the virus to escape, when presented with the low pH of the normally entrapping endosome.

Visualization methods used for examining structural change however, are typically derived from methods for static structures. Typically these representations are overlays, or animations of multiple traces of the molecular backbone, with each trace representing a different point in time [Krebs and Gerstein 2000]. Such representations are effectively flow representations using timelines (the linked location of the atoms at each discrete point in time) to depict motion. While timelines are ideal for visualizing certain complex flow features, being orthogonal to the flow motion, they are not an intuitive method for visualizing the motion itself. We propose the use of atomic pathlines (the path of each atom over time) as an alternative for representing molecular change. This orthogonal transposition of the visualization allows the 3-dimensional motion of individual atoms to be examined in detail, as well as the overall motion of domains to be understood in concert.

The molecular motion we are studying is a potential conformational change undergone by the AAV2 capsid (external shell, or packaging) protein, on experiencing a pH shift after endocytosis and acidification of the endosome vescicle. The AAV2 capsid is composed of 60 identical protein subunits (Figure 1) arranged in 20 symmetric trimeric groups of 3, aligned to the faces of an icosahedron. The 5-fold axes of symmetry (Figure 1) posess an apparent pore, while the 3-fold axes of symmetry (Figure 3) are comparatively tightly interwoven.

While not yet completely characterized at the molecular level, AAV2 escape and targetting of the nucleus requires passage through an acidified endosome [Bartlett et al. 2000]. We hypothesize therefore that the capsid undergoes a conformational change at low pH, exposing a protected functional domain, and that the conformational change displays hysteresis or anisotropism upon release to normal neutral cytosol pH levels. Analyzing the pathlines followed by atoms during this change, rather than the individual conformations assumed during folding, will allow us to better understand the conformational change, determine maximally changing regions, and predict candidate domains for further biochemical study.

1)

2)

3)

Background and Rationale:

Adeno-Associated Viruses (AAVs) are promising candidates for gene-therapy vectors. While incapable of autonomous replication, they maintain the ability to efficiently infect host cells, and lacking a helper virus to enable replication, establish persistence in the host by integrating into the host genome. By inserting new genes into an AAV genome, and denying the helper virus necessary for replication, AAV may be used to deliver these genes into the genome of a human host, potentially treating a large range of genetic diseases or deficiencies.

Two of the factors that must be overcome in applying AAV as a gene-delivery technology are the non-selectivity of AAV targeting of host cells, and the wide pre-exposure of human populations to AAV from natural infections.

Non-selective delivery of genes by AAV is a problematic due to the possible toxic effects of some genes in non-regulated contexts. Selectivity can be conferred by localized delivery, incorporation of appropriate regulatory motifs along with the therapeutic genetic material, or by developing mutant AAVs with binding characteristics that allow them to target specific cell lines. The first approach may be successful for localized injection, but is not possible for system-wide applications. The second approach is made difficult by our limited understanding of the vast complexity of human gene regulation, and further confounded by the practical limitation of the space available in the AAV capsid for packaging additional genetic material. The final approach requires an intimate understanding of the structure and function of the viral capsid, and the portions of the capsid that may be altered to confer modified targeting selectivity, without interfering with other necessary functional or mechanical motifs.

Addressing the wide-spread natural immunity to AAV requires similar understanding of the capsid structure and function. Modified capsid proteins may be engineered such that they do not present the epitopes to which the immune system responds, thereby evading natural immunity, but such modifications again must not interfere with necessary capsid functions.

We became interested in better visualization techniques for understanding molecular motion while studying a hypothetical, but apparently necessary conformational change in the AAV2 capsid protein. Calculations of the conformational changes undergone by the capsid when exposed to low pH, and then returned to neutral pH (a series of transitions that are known to be physiologically necessary for the function of the virus), indicated that the RMS distances between the changing capsid structure and the native structure were at a maximum at a midpoint between neutral and low pH, and settled back to near-native coordinates at the low end of the pH simulation. The reverse simulation followed a similar pattern, again resulting in near-native coordinates, despite physiological evidence that the capsid attains and maintains a new function as a result of exposure to this acidified environment in vivo. Simple 2-dimensional backbone plots, and 3-dimensional backbone animations were insufficient to visualize the overall structural change, and to understand the relationship between the molecular motion and the functional changes of the capsid.

4)

5)

6)

Methods:

The AAV2 capsid monomer (PDB Accession 1LP3) structure was transformed to trimer symmetry, then energy minimized using Amber 8.0 for 100,000 0.002ps cycles at 300K. Solution conditions were 0.1 Molar NaCl, pH 7.0. The energy stabilized after roughly 20,000 cycles (40ps). To simulate the acidification of the vescicle and corresponding structural changes, the pH was changed to 4.5, and 50,000 additional minimization steps were run. Molecular structures were captured every 50 timepoints (0.1ps). Pathlines for individual atoms were extracted from the backbone atoms of a single subunit and visualized by generating VRML graphs, or POV-Ray scene descriptions that can be raytraced to generate pathline animations with enhanced features.

Results:

A pathline-rendering (POV-Ray) of the motions undergone by the a monomer of the AAV2 capsid protein, on transition from neutral to acidic pH, is presented in Figure 4. The relatively stable region of the protien is primarily the protein core, and the exterior capsid surface. The two regions displaying dramatic motions are primarily directed towards the capsid interior, though one loop does participate in interactions forming the trimeric subunit. There is also considerable motion in the region of the protein that forms the apparent pore at the 5-fold axis of symmetry (The 5-fold axis of symmetry and motions around this region are highlighted in Figures 5 and 6). Alternatively, less dynamic but more interactive visualizations can be adequately constructed in VRML for convenient browsing or delivery via the WWW.

Comparisons with existing molecular-motion viewing techniques are shown in Figures 7 and 8. The defacto standard static presentation is the overlay of multiple conformations as shown in Figure 7. With relatively distant conformations overlayed, each customarily rendered with a color spectrum distributed along the protein backbone, overall locations of motion are readily apparent, but the temporal sequence of motion is lost, and rapidly-moving areas become visually uninterpretable. Plotting more conformations, closer together, and rearranging the spectrum to shade temporily, rather than along the backbone (Figure 8), provides a greater sense of the motion, but sacrifices intuitive understanding of the structure.

Counterintuitively, it is the structure itself that occludes visual interpretation of the structure in Figure 8. Recognizing that it is the near-pathline-like solidity of the paths traced by the atoms, that allows the motion to be understood, and reducing the structural depiction to a single timepoint, we arrive at our proposed depiction of a single structure, its atoms sweeping along the atomic pathlines of the motion.

7)

8)

9)

10)

Figures 9 and 10 focus on the motion of the N-terminal domain across the entire neutral-acidic-neutral simulation. Figure 9 depicts it in the POV-Ray rendered form, and Figure 10 in the VRML form. The expected conformational anisotropism in the return to neutral pH is clear in each, from the distinct paths of the backbone atoms.

Celestia A Vocal Interaction Music Game

Cheng Yang Yang Shi
Carnegie Mellon University

ETCglobal Carnegie Mellon SIGGRAPH2013

Introduction

Voice is one of the most natural means of expression, we always underestimate our vocal instinct as game interface, what if we use this instinct to power up a beautiful game? Incorporating visualization technique, Celestia uses voice input based on pitch detection as a primary controller, and provides insight into innovation of vocal interaction.

Design

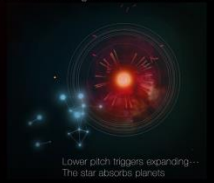
The initial idea came to us as a scenario of someone playing a game using only her voice. She is charmed with this mysterious celestial environment which merges visual and vocal elements seamlessly.

We started with the story, a newborn star wants to grow. However, comets and nebulae might hurt it in its journey. Fortunately, user's voice can help it gain more power by absorbing smaller planets.

Evolution of the star

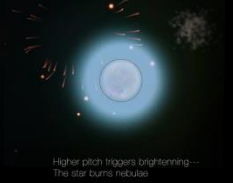
Game Play

The purpose is to guide a newborn star through the universe with melody. The user's voice can enlarge the star to absorb smaller planets and survive encounters with comets, nebulae. Every element of the experiential aesthetic is tied to the background music; the constellation is the music visualization with three different colors reacting to high, mid and bass range of the soundtrack in real-time.



Lower pitch triggers expanding…
The star absorbs planets

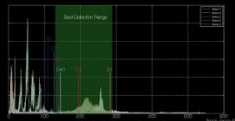
Middle pitch triggers dodging…
The star dodges comets



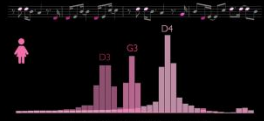
Higher pitch triggers brightenning…
The star burns nebulae

Approach

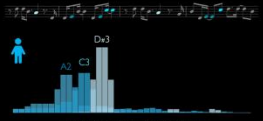
By using Fast Fourier Transformation algorithm and voice spectrum analysis, we precisely selected 3 pitches as controllers, because they are in the best detection range and are in perfect harmony with background music. The whole experience of playing Celstia can be singing a song by connecting those notes in chord as game progresses. We also adopted two different pitch ranges to accommodate both female and male voices.



Voice detection analysis



3 triggers match background music



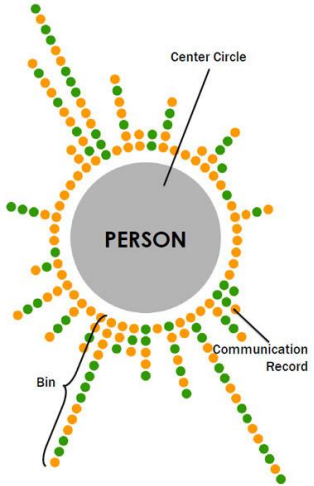
Lower frequency set for male voice

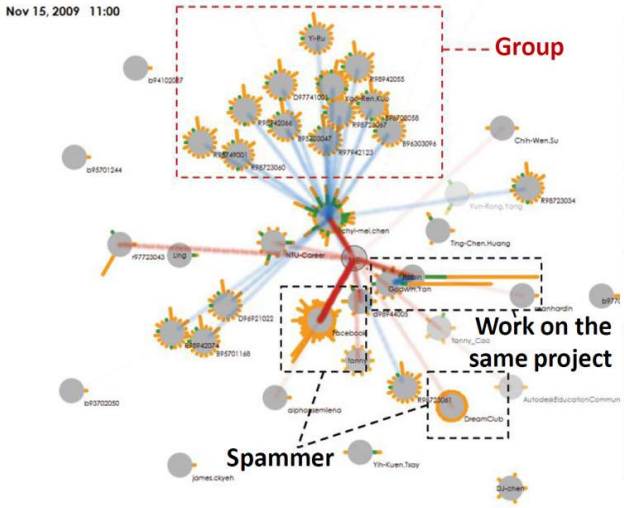
Future Work

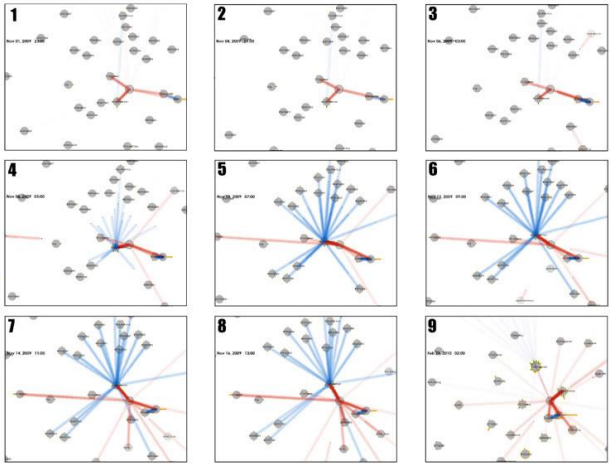
We introduced Celestia to a vocalist to improvise the game for a live audience, it turned out to be a great success, people think "it's visually and aurally appealing". Celestia is not confined to human voice, users can play instruments, such as guitar, harmonica or water bells.

We will keep exploring more possibilities of Celestia, iOS version will follow soon…

Presentation of Time-Evolving Activities Using Communication Archive Data







Planetary Defence

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André Stenlund andreste@kth.se
Jonas Andrée jonandre@kth.se

Introduction

Planetary Defence is an online 3D graphics multiplayer game. You shoot rockets at your opponents and you can shoot your opponents' rockets down.

Motivation

- Build lightweight socializing
- Learn new technologies
- Design Entertainment

Goals

- Multiplayer
- Multiplatform
- High resolution
- 3D game
- On the web

Technology

- WebGL
- Web sockets
- Html5
- Three.js

Interaction

- Swipe / click and drag
- Tap / click

Mobile Game Play

Conclusions

- Real-time 3D graphics
- Multiplayer interaction
- Online
- No downloading!

References

1. Three.js https://github.com/mrdoob/three.js
2. WebGL http://www.chromeexperiments.com/webgl/
3. Parisi, Tony (2012). *WebGL Up and Runing.* USA: O´rilly Media

bit.ly/QwaRhj

AGI12 Advanced Computer Graphics and Interaction 2012

Demo: Questions

- Clarifying questions:
  - What do you mean by “so and so”?
  - I don’t understand, could you explain it differently?
  - Could you talk about that further?
  - Tell more about that...
  - How does that make you feel?
  - ”Following” questions

Demo: Questions

- Leading questions:
  - What do you think?
  - Is it working for you?
  - Do you like it?
  - What would you improve?
  - What would you change?
  - Why don't you like it?
  - Why do you like it?

HERE, LET ME SHOW YOU!

Observers

- Pen and pad
- Take copious notes
- Count, count, count!
- Take photos
- Record (VERY SHORT) videos – be selective
- Record (VERY SHORT) testimonials

Remember: Deliverable

- Working VIC Demo
- Code with good comments
- Webpage with:
  - Description
    - Goal and motivation of the project
    - Explanation and Justification of the graphics and interaction technologies used and developed
    - Challenges
    - Obstacles
    - Related work
    - Lessons learned
  - Photos
  - "Making of" documentary (2 minutes)
  - Demo Reel (30 seconds)
  - Optional PR material (logo, trailer, flyers, posters, catalog)
  - User testimonials (what did people say)

Demo: Audience

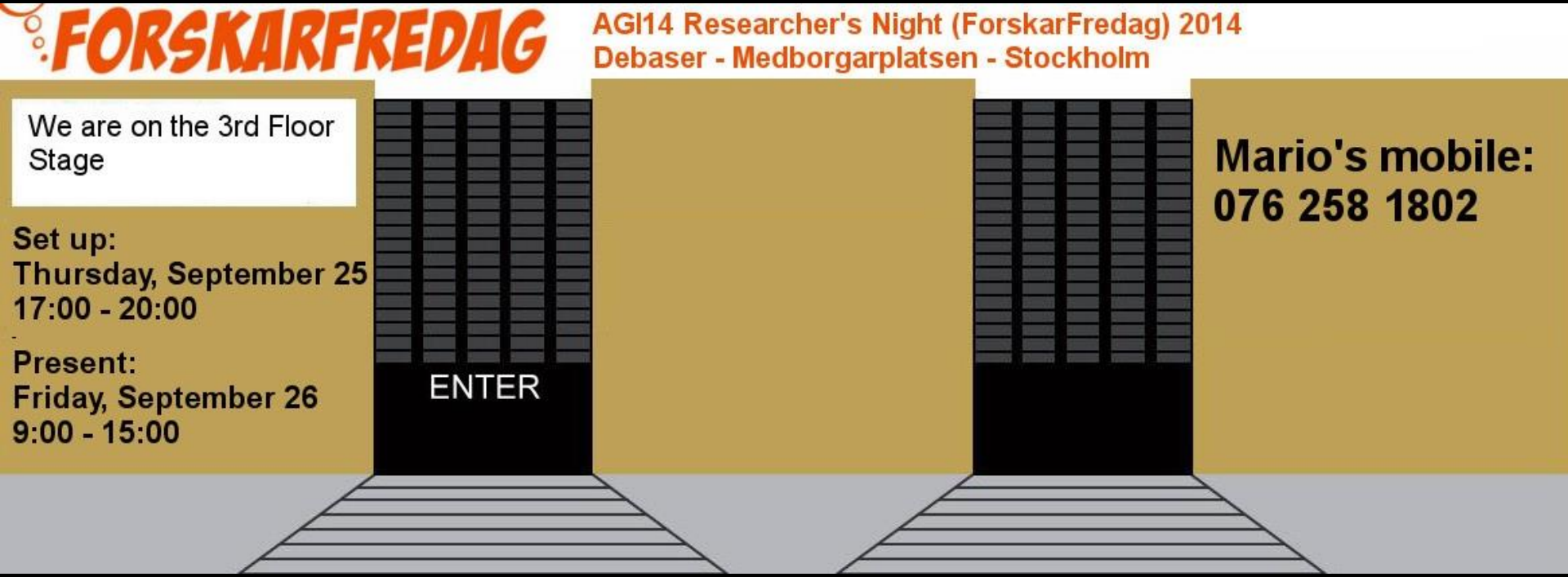
- Take notes
- Comment during demo
- Take notes of comments
- Transfer your notes to the facebook wall
- Help each other

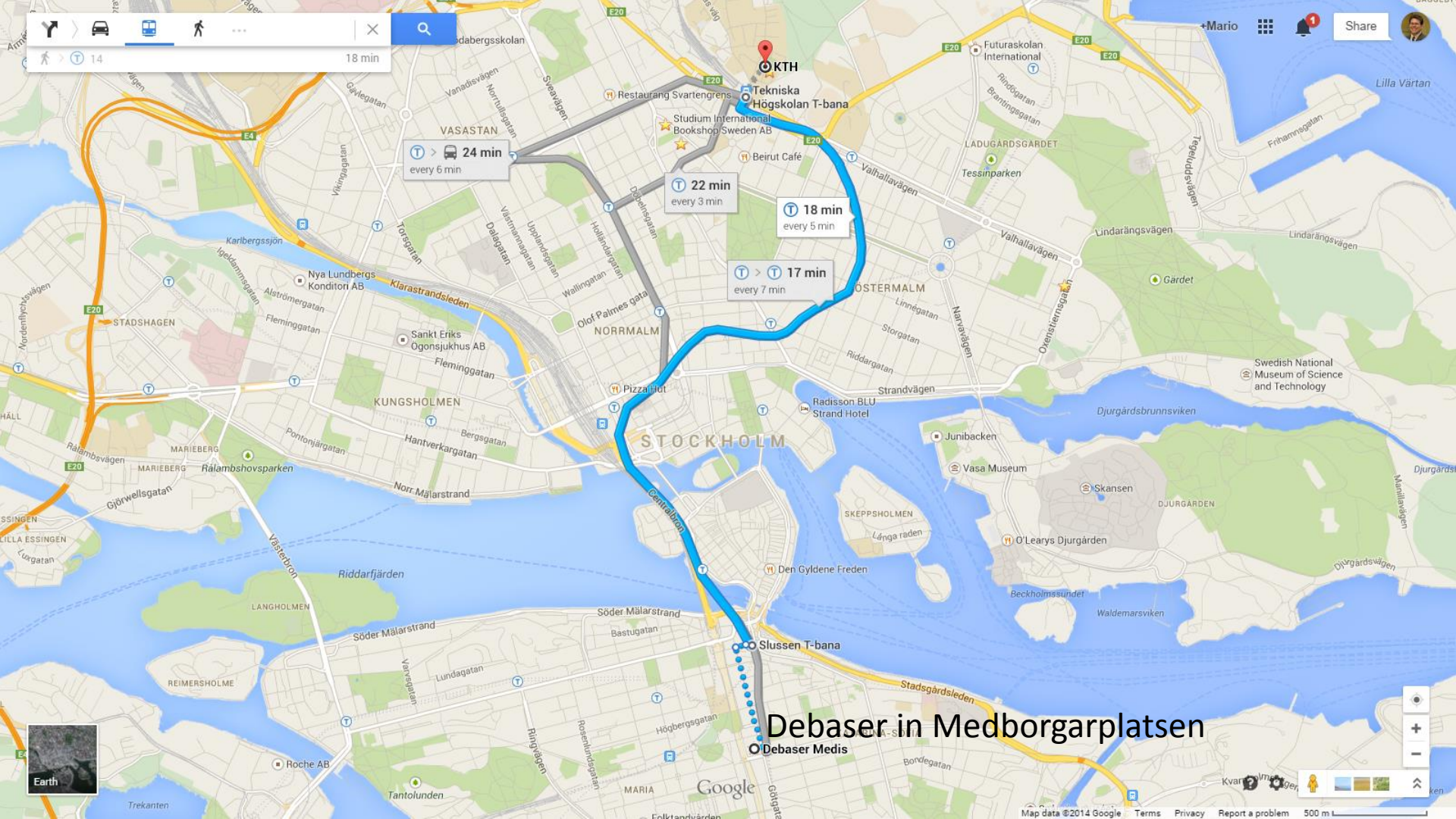
Demo: Grading

- Pass with Honors – 5/5
- Pass – 4/5
- Not pass – 0/5

Questions?

ForskarFredag




KTH
Tekniska Högskolan T-bana
Restaurang Svartengrens
Studium International Bookshop Sweden AB
Beirut Café
24 min
every 6 min
22 min
every 3 min
18 min
every 5 min
17 min
every 7 min
VASASTAN
ÖSTERMALM
NORRMALM
KUNGSHOLMEN
STOCKHOLM
STADSHAGEN
LADUGÅRDSGÄRDET
Tessinparken
Gärdet
Futuraskolan International
Nya Lundbergs Konditori AB
Sankt Eriks Ögonsjukhus AB
Pizza Hut
Radisson BLU Strand Hotel
Swedish National Museum of Science and Technology
Junibacken
Vasa Museum
Skansen
DJURGÅRDEN
SKEPPSHOLMEN
O'Learys Djurgården
Den Gyldene Freden
Slussen T-bana
Debaser Medis
Debaser in Medborgarplatsen
Riddarfjärden
Djurgårdsbrunnsviken
Beckholmssundet
Waldemarsviken
LANGHOLMEN
REIMERSHOLME
MARIEBERG
LILLA ESSINGEN
Roche AB
Tantolunden
MARIA
Klarastrandsleden
Centralbron
Västerbron
Stadsgårdsleden
Strandvägen
Valhallavägen
Lindarängsvägen
Söder Mälarstrand
Norr Mälarstrand
Hantverkargatan
Fleminggatan
Olof Palmes gata
Torsgatan
Sveavägen
Vanadisvägen
Norrtullsgatan
Dalagatan
Upplandsgatan
Hollandergatan
Döbelnsgatan
Wallingatan
Vikingagatan
Gävlegatan
Karlbergssjön
Igeldammsgatan
Alströmergatan
Nordenflychsvägen
Rålambsvägen
Rålambshovsparken
Gjörwellsgatan
Pontonjärgatan
Bergsgatan
Lundagatan
Varvsgatan
Ringvägen
Rosenlundsgatan
Högbergsgatan
Bastugatan
Linnégatan
Storgatan
Riddargatan
Narvavägen
Oxenstiernsgatan
Tegelbrukspromenaden
Frihamnsgatan
Brantingsgatan
Rindögatan
Lilla Värtan
Djurgårdsvägen
Manillavägen
Långa raden
Bordegatan
Trekanten
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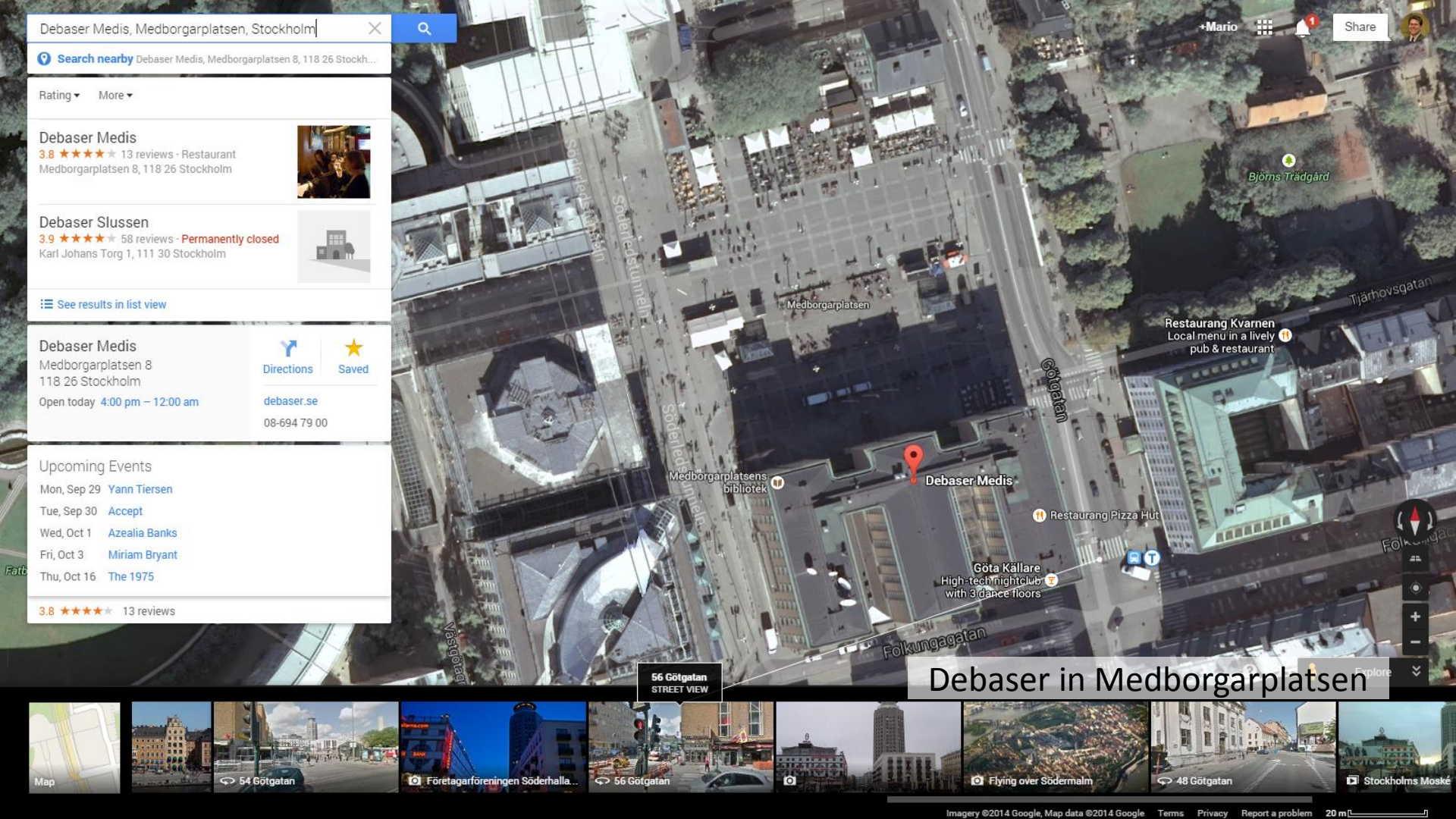
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Rating
More
Debaser Medis
3.8 ★★★★☆ 13 reviews · Restaurant
Medborgarplatsen 8, 118 26 Stockholm
Debaser Slussen
3.9 ★★★★☆ 58 reviews · Permanently closed
Karl Johans Torg 1, 111 30 Stockholm
See results in list view
Debaser Medis
Medborgarplatsen 8
118 26 Stockholm
Open today 4:00 pm – 12:00 am
Directions
Saved
debaser.se
08-694 79 00
Upcoming Events
Mon, Sep 29 Yann Tiersen
Tue, Sep 30 Accept
Wed, Oct 1 Azealia Banks
Fri, Oct 3 Miriam Bryant
Thu, Oct 16 The 1975
3.8 ★★★★☆ 13 reviews
+Mario
Share
Björns Trädgård
Medborgarplatsen
Restaurang Kvarnen
Local menu in a lively pub & restaurant
Tjärhovsgatan
Götgatan
Medborgarplatsens bibliotek
Debaser Medis
Restaurang Pizza Hut
Göta Källare
High-tech nightclub with 3 dance floors
Folkungagatan
Södra Länken
Södra Länkstunneln
Västgötag
56 Götgatan
STREET VIEW
Debaser in Medborgarplatsen
Map
54 Götgatan
Företagarföreningen Söderhalla...
56 Götgatan
Flying over Södermalm
48 Götgatan
Stockholms Moské
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Privacy
Report a problem
20 m


Untitled
Aram Azhari
PHOTO SPHERE - Jul 2013
Debaser in Medborgarplatsen
Debaser
simhall
Sersus
Click highlighted areas to see images
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Debaser 3rd floor stage

Debaser 3rd floor stage

ForskarFredag 2012

ForskarFredag 2012

ForskarFredag 2013







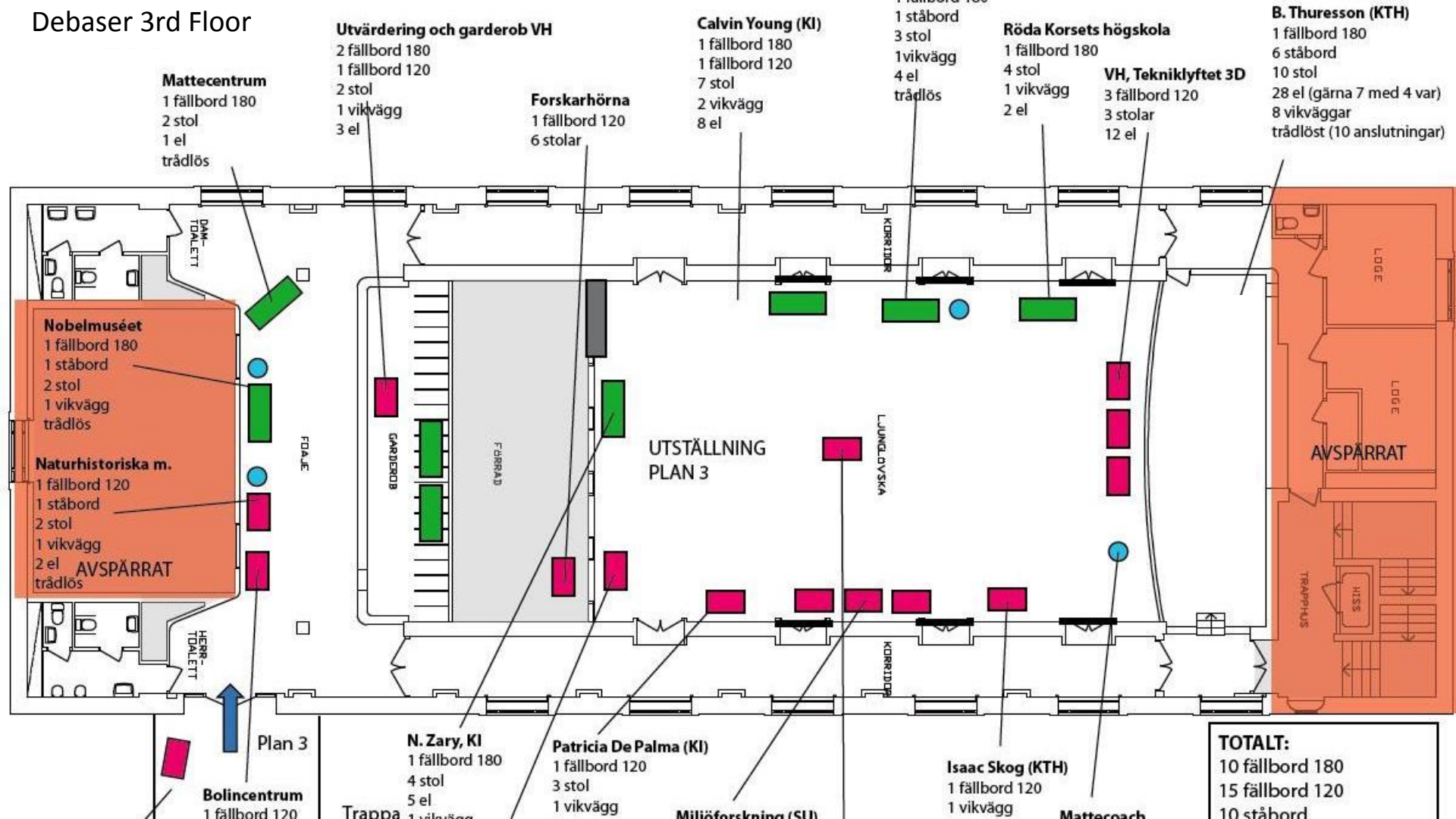




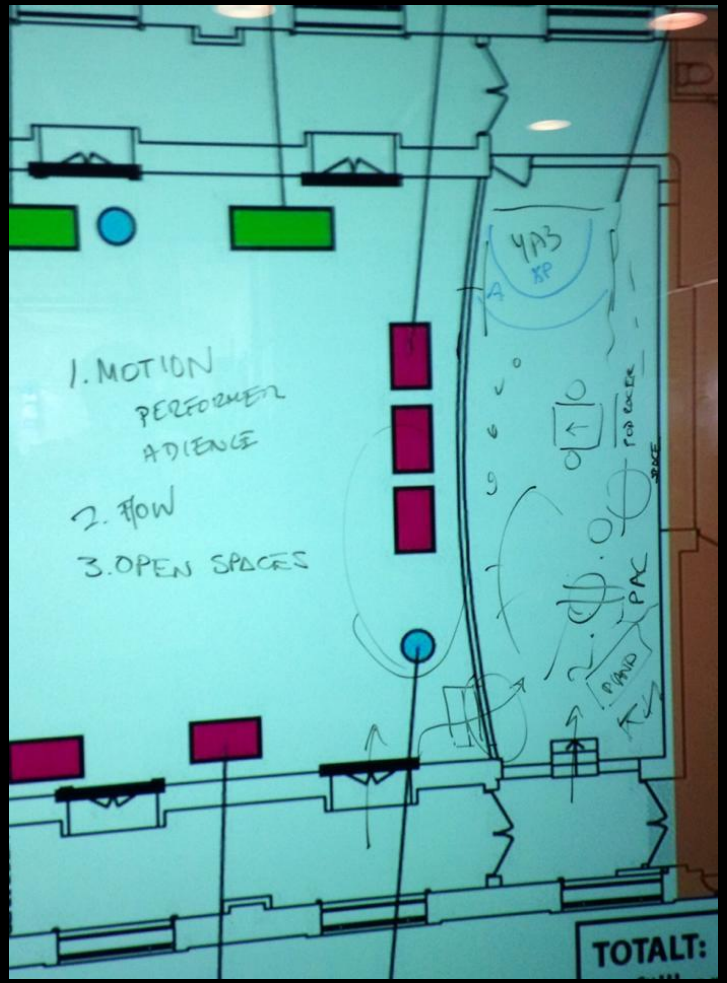

ForskarFredag 2013

ForskarFredag 2013

Debaser 3rd Floor



Space Distribution



Grading of ForskarFredag

- 10%
- Group
  - 9:00 – 16:00 (- 1% per hour missed)
- Individual component – KTH social
  - Answer the survey which will be posted on Friday, September 26 at 17:00 before Sunday September 28 before 23:55. It is very important that you answer it as soon as possible after ForskarFredag is over.

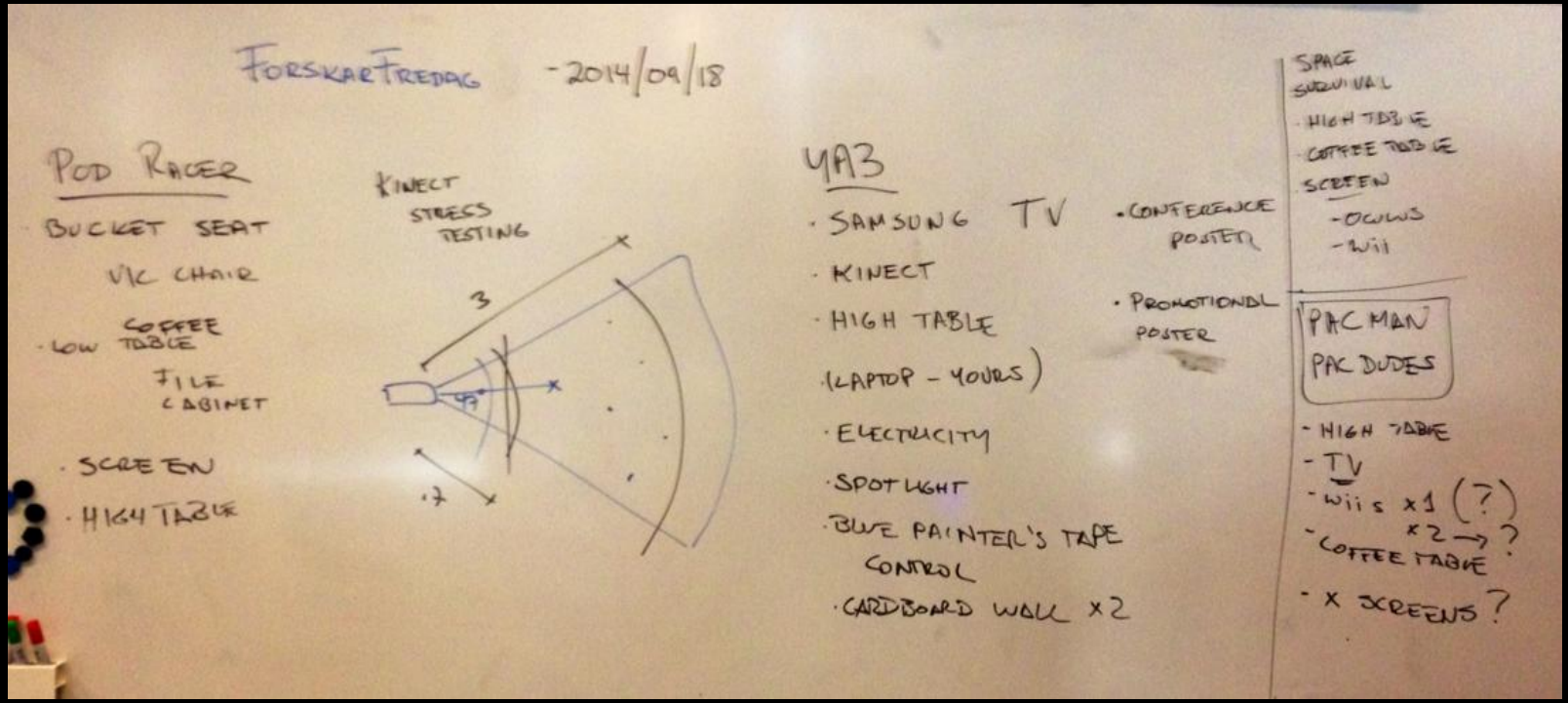
ForskarFredag Survey

- What did you learn presenting, observing, interacting?
- What were the most common questions?
- What were the challenges?
- What were the rewards?
- A few technical questions.

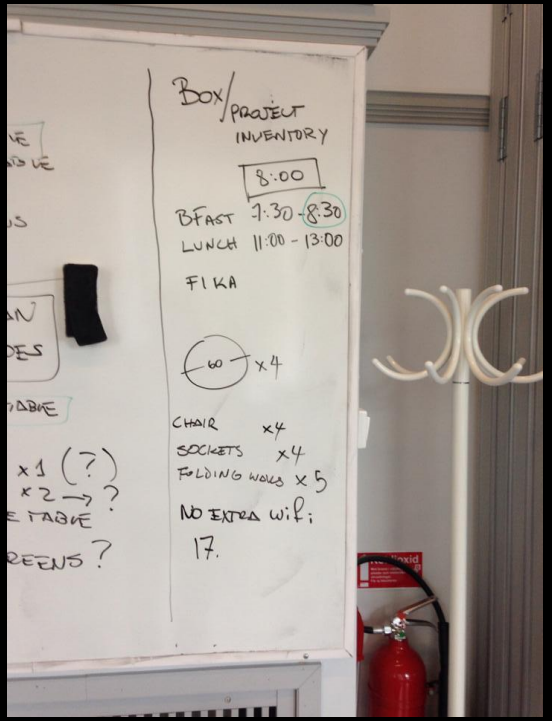
Communication

- Poster feedback
- Printing (Thursday morning)
- Other communication materials
  - Web page
  - Flyers
  - Logo
  - Slogan
  - …

Requirements



Requirements



Thank you!

marior@kth.se

Questions?