（株）ポリフォニー・デジタルにおける対外発表活動とインターンの実績

～ゲーム会社とCGコミュニティの繋がり～

Polyphony Digital's Technical Presentations and Internship Results:
The Connection between a Game Company and the CG Community

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Kentaro Hirai

Today's Goals

- In this presentation

  - **Our recent technical publications**
  - **Results from internships**
  - **Our connection with the CG Community**

- What we want you to remember

  - The name of **"Polyphony Digital Inc."**
  - We are developing **high-end racing games**.
  - We are **recruiting new graduates and interns**!

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Polyphony Digital Inc.

A game developer, **"Gran Turismo"** Series

- 100% owned by Sony Interactive Entertainment Inc.

- Number of employees : 226 (※)
  - Engineers : 57

- Offices in Tokyo, Fukuoka (and overseas)

Recently focusing on recruiting new graduates and interns!

※ As of 2022

Gran Turismo Series

Racing game series celebrating 25th anniversary

- Latest work: "Gran Turismo 7"
  on PlayStation® 4/5
  (Released on 3rd March)

- High-quality visual expression

  - Real-time rendering
  - Physics engine

Utilizes the latest trend of
computer graphics

  - Real-time raytracing, etc.

GRAN TURISMO® 7
THE REAL DRIVING SIMULATOR

About Our
Technical Presentations

Purpose of Technical Presentations

- Share our knowledge with the computer graphics community and enhance our presence

- Increase our academic motivation

Past Records

https://www.polyphony.co.jp/publications/

- VC+VCC

- CEDEC

- GDC

- SIGGRAPH ASIA

- Nature (Collaborative work with Sony AI)

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CEDEC

- What is CEDEC

  - Game development conference
  - The biggest one in Japan

- In CEDEC 2022

  - Keynote speech by our president, Kazunori Yamauchi
    "25 Years of Gran Turismo: Its Philosophy and Outlook for the Future"

  - **5 technical courses about Gran Turismo**

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Our Courses in CEDEC 2022

- "Gran Turismo Sophy: Top-player level AI with Deep Reinforcement Learning" (Collaborative work with Sony AI)

- "Rendering Techniques in Gran Turismo 7"

- "Measurement Techniques and Appearance Design Case Studies for Course Creation in Gran Turismo 7"

- "Procedural Game Content Boot Camp 2022 - Gran Turismo 7"

- "USD Application Case Studies in Gran Turismo 7"

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" Gran Turismo Sophy: Top-player level AI with Deep Reinforcement Learning "

[Kenta Kawamoto (Sony AI) / Shuichi Takano]

- Gran Turismo Sophy

  - Racing AI with deep reinforcement learning
  - Copes with high skill and racing etiquette
  - Published in a Nature issue (※)

- Explains the techniques used for training an AI

  ※ Wurman, P.R., Barrett, S., Kawamoto, K. et al. Outracing champion Gran Turismo drivers with deep reinforcement learning. Nature 602, 223–228 (2022). https://doi.org/10.1038/s41586-021-04357-7

The international journal of science / 10 February 2022

nature

DRIVING FORCE
AI algorithm outcompetes human champions in *Gran Turismo* racing game

" Rendering Techniques in Gran Turismo 7 "

[Kentaro Suzuki / Shuichi Takano / Kentaro Hirai]

- Explains the three topics below
    - Real-time ray tracing
    - Real-time time/weather change, Rendering the sky
    - Shaders for materials with meso-scale asperity

" Measurement Techniques and Appearance Design Case Studies for Course Creation in Gran Turismo 7 " [Yuhei Kitada / Taro Ozaki]

- Measurement techniques and data applications to reproduce real circuits

- Design of structures and landscapes for original circuits
  - Utilize architectural, civil engineering and urban planning expertise

# " Procedural Game Content Boot Camp 2022 - Gran Turismo 7 " [Akira Saito / Wataru Iizuka]

- Procedural reduction of terrain models
  - Define effective operators by mathematically analyzing the geometry

- Procedural modeling of car models
  - Generating part models, prototyping, application to debugging

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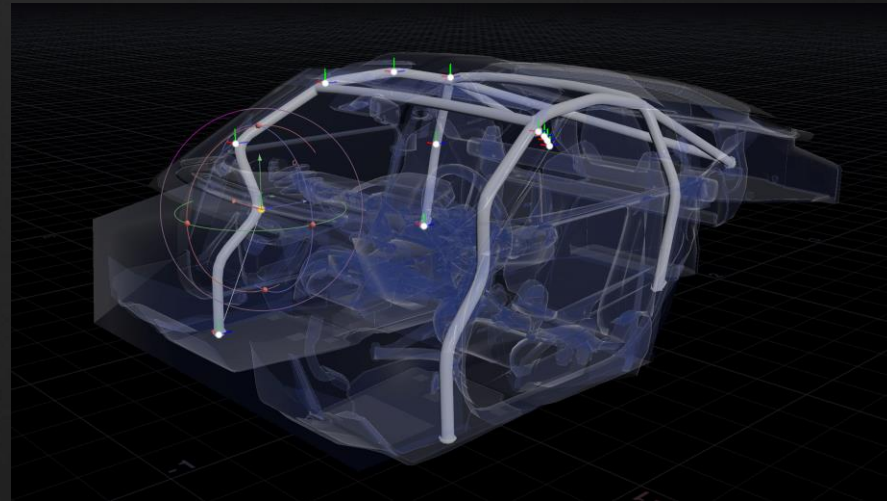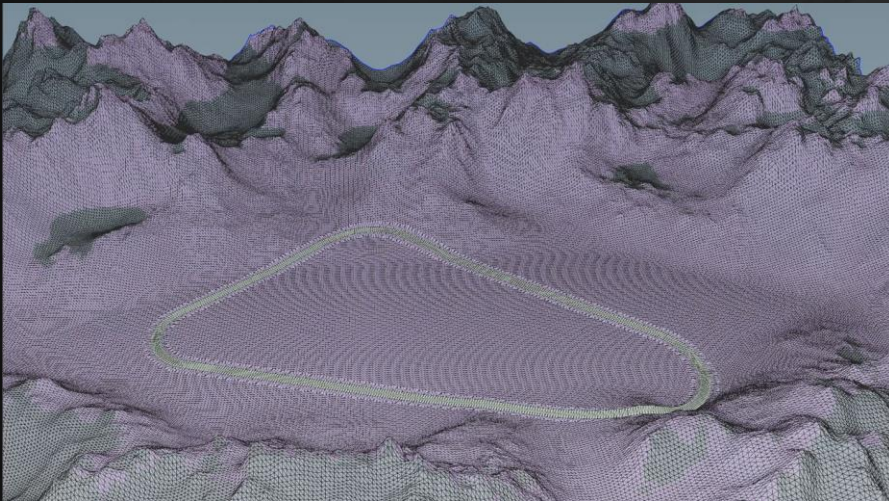
" USD Application Case Studies in Gran Turismo 7 " [Megumi Ando]

- Early example of introducing USD to large-scale game production

- USD (Universal Scene Description): Scene format for general purpose
  - High versatility, extendibility and scalability
  - Simultaneous editing by multiple persons
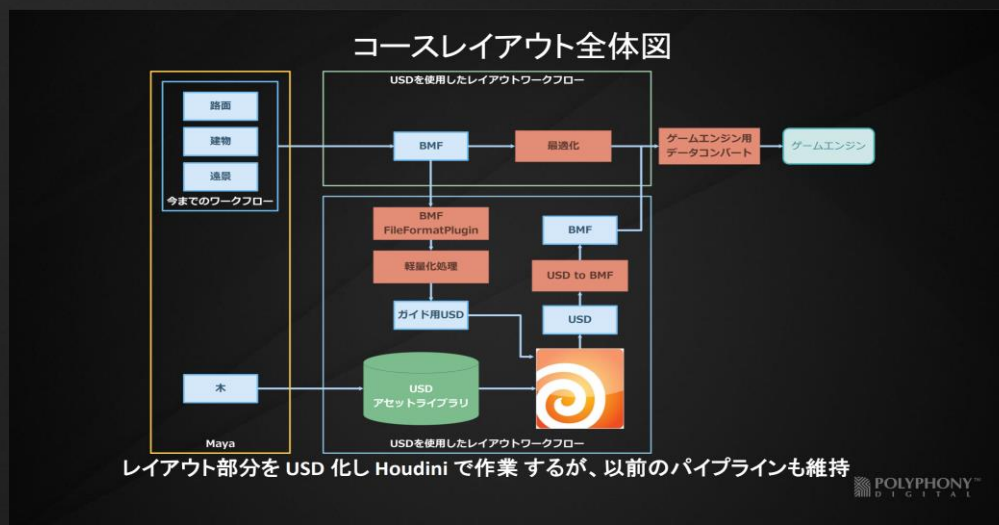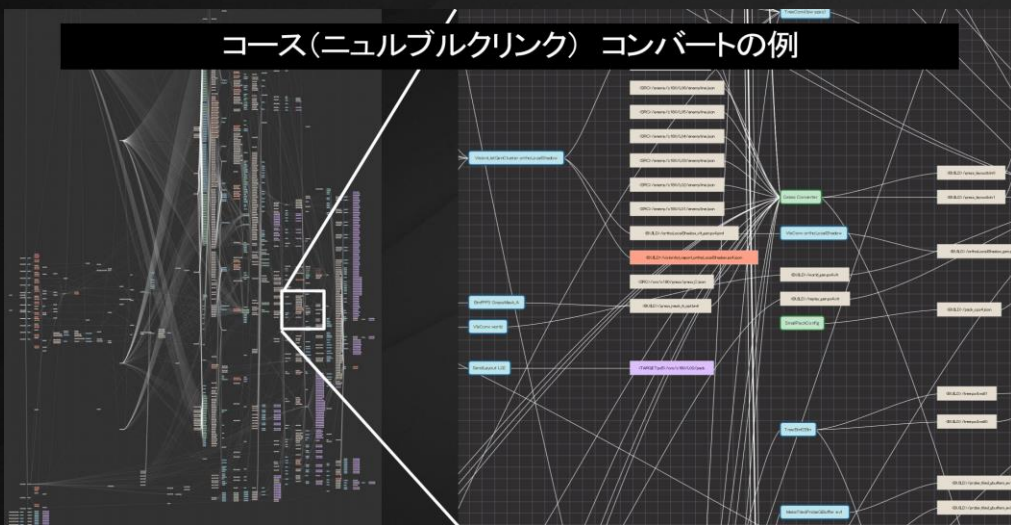
About
Our Internships

Purpose of Internships

- **Our purpose:**
  - Increase matching accuracy

- **Your benefits:**
  - Experience work in game production

    → **Helpful for planning your career**

Outline of Internship Program

- For students interested in developing video games
- Year-round recruitment
- Length: 1~2 month(s)
- Assignments provided for each
  - Not like doing uniform course

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Our Internship Results (Excerpt)

- **"Implementing Depth of Field in a Ray Tracer for Development of GT"**

- **"Experiment of VHS-like Screen Filter"**

- **"Improvement of fireworks defined by explicit functions"**

- "Investigating and Verifying Specular Occlusion Technique"

- "Development of FBX motion analyzer"

- "Implementing Fluid Simulations on GT Particle Systems"

- "Developing Error Detection Tools for Automatic Testing of Game Screens"

- "Creating a converter from GT Model Format to glTF"

- "Researching on Application of Shape Synthesis by Machine Learning to Car Modeling"

- "Partitioning and Speeding up Jenkins Jobs for GT User Interface Builds"

" Implementing Depth of Field in a Ray Tracer "

- Length: one month

- Implement Depth of Field (Bokeh) in our internal ray tracer

- Support aperture of arbitrary shape
  - Sampling points from polygonal area with uniform probability distribution

- Design UI in consultation with our artists

" Experiment of VHS-like Screen Filter "

- Length: one month

- Real-time VHS-like screen filter
  - Implemented on computing shader
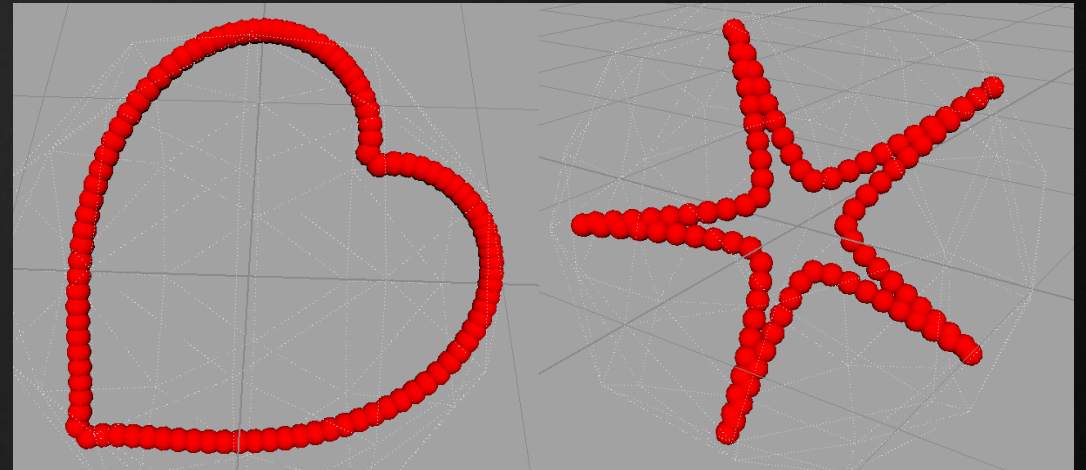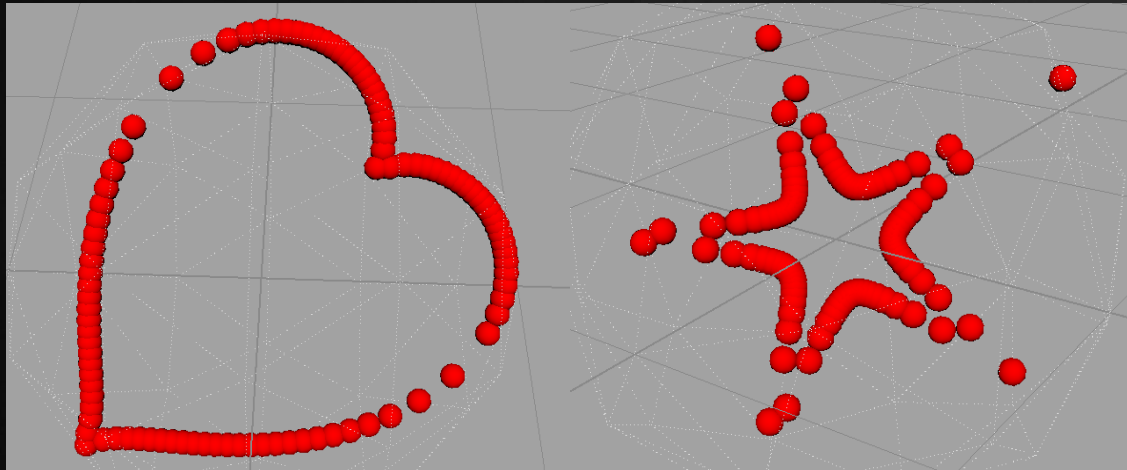 - Modeled with physical properties of analog wave and VHS

" Improvement of fireworks defined by explicit functions "

- Length: one month

- Shapes of fireworks are defined by explicit functions $(y = f(x))$
  - Sampling x at even intervals makes distances among points uneven

- Tabulate correspondence between x and distance, and tune the sampling intervals

From post-questionnaire

- "It was a good experience to develop on a large scale project"

- "I learned and developed in many different areas (such as statistics and ray tracing)."

- "I was able to do tasks that I could not do in other internships (such as collaboration with artists)."

- "I was able to do things we couldn't do as hobby."

- "I learned about the atmosphere of actual development sites and the skills needed to find a job."

- "It was helpful for me to set up the tasks related to my specialized field."

- "It was like an extension of college."

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Polyphony Digital Inc. is

connected with the CG community, including academia,
through technical presentations and internships.

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Polyphony Digital Inc. is

connected with the CG community, including academia,
through technical presentations and internships.
We want to strengthen the connection!

Thank You!

- Our booth is located across from the reception desk

  - You'll find **the racing game cabinet**!

- We also have a Slack channel

Feel free to ask any question at our booth or on Slack!