Network Analysis of Massively Collaborative Creation of Multimedia Contents
Case Study of Hatsune Miku videos on Nico Nico Douga

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Massively Collaborative Creation

• A new style for content creation enabled by Web
  – Web 2.0 style on content creation
• Key features
  – Massive participation
    • Numerous people are involved, even though they often do not know each other
  – Creating contents collaboratively
    • Contents are created as a result of many people’s effort
    • Just sharing contents is not enough. Collaboration is important
Massively Collaborative Creation

• Examples (text content)
  – Wikipedia: Yes
  – Yahoo! Q and A: Yes
  – ...

• Examples (multimedia content)
  – YouTube: *No in general* (few collaborative creation)
  – “Hatsune Miku” phenomena on Nico Nico Douga: Yes!

“Hatsune Miku” Phenomena

• A lot of video related to “Hatsune Miku” are posted to a video site (“Nico Nico douga”)

• It’s really Massively Collaborative Creation of Multimedia contents
  – Massive Participation: Yes
    • Thousands of people create tens of thousands of videos
  – Collaborative Creation: *Really Yes!*
    • Sharing and *Re-using* of digital contents
  – Multimedia: *Really Yes!*
    • Sounds (songs and music), pictures (2D & 3D), movies
Example!!

- Title: Shooting star –short ver.- like an ending movie
- Creator:ussy
- URL: http://www.nicovideo.jp/watch/sm2030388

Re-using on
Nico Nico Douga & Hatsune Miku

- Shooting star –complete ver.- Creator: FEDis
- Song and Movie
- Many pictures by many authors
- Shooting star –short ver.-like an ending movie Creator:ussy
- 3D model
- 3D Miku sings ‘01_ballede’ Creator: kiokio
- Song
- melody... 3D PV ver1.50 Creator: ussy
- Picture
Findings

• Massively collaboration creation generates large and sparse connected creators’ network
• Different categories of creators have different roles in evolving the network
• Creators’ behavior is similar to audiences’ one
  — It likes Web2.0 style (A consumer is a creator!)
• Some of communities in the network are centralized, and others aren’t
Our Approach

• We adopted a method of social network analysis as a basic method to investigate the phenomenon

• We investigate how different types of creators interact to create new content through their social network

Nico Nico Douga & Hatsune Miku

• *Nico Nico Douga* is the most popular video sharing website in Japan
  – The most interesting function is the direct overlaying of comments on videos

• *Hatsune Miku* is a version of singing synthesizer application software
  – It has inspired many people to produce various music, picture, and video compositions
Data Collection

• 36,709 videos with tag ‘Hatsune Miku’ (31 May 2008)

• Select 7,138 videos viewed more than 3,000 times
  – Crawled during 1–5 June 2008
  – The metadata include view times, uploaded date, uploader name, tags, and a description

• 7,138 videos were uploaded by 2,911 unique contributors
  – Note:
    • We regard the uploader as the video creator
    • On Nico Nico Douga, only the uploader is identified
    • The uploader *may not* be the creator of the video

How to make video’s network

• The description of the movie often includes *hyperlinks to other videos* showing trail of the video’s creation
  – On Nico Nico Douga, a creator cites other videos if a sound, image, or any part of another video is used as acknowledgement

• By tracing these hyperlinks, we generated a reference network of videos

• Among the collected videos, 4,585 videos include hyperlinks in the description

• Movie network
  – 4,585 nodes (videos)
  – 12,507 links (hyperlinks among videos)
How to make creator’s network

• We set a relation from creator of video A to creator of video B if video A has link to video B
  
  *It implies that Creator A uses contents of Creator B*

• In this way, we generated a network among creators

• Creators network
  
  – 2,164 nodes (creators)
  
  – 4,368 links (relationships among creators)

• We regard this network as a social network of creators
Characteristics of the Network

• The network is large and sparse
  – The diameter of this network is 21

• Scale free network
  – A few nodes (creators) gather many links (citation)

• Network centrality correlated to the number of play times
  – Many cited videos are popular for users
  – Creators’ behavior is similar to audiences’ one
Category of Creation Activity

• We classified creative activities related to Hatsune Miku into four categories:
  – **Songwriting**
    • Create an original song (lyrics and melody)
  – **Song creation**
    • Tune the software to create singing songs
  – **Illustration**
    • Drawing their favorite characters by themselves
    • Produce many different scenes and facial expressions
  – **Editing**
    • Choice videos and package them to one video

Classify videos

• Classify videos and creators into creation categories automatically using tags for videos

• Provide a set of tags that are important for specific creation categories.
  – Ex. Tag “Miku Original Song” -> Category “Songwriting”
  – Ex. Tag “3D Hatsune Miku Project” -> Category “Illustration”

• A video is classifiable into two or three categories if it has tags for these categories
• The creator’s category is generated by aggregating her/his works

• Furthermore, we manually excluded 179 Editing videos
Community on Creators Network

- We analyze the creators’ community
  - The term “creators’ community” means a tight group of nodes within social network of creators
  - We adopt Newman clustering to detect such communities from the social network of creators

- Newman clustering generated 83 clusters (communities) from the social network of creators
- We especially investigated 10 clusters of which the size is greater than 50
Structure of the biggest clusters

- Songwriting is often a key person, meaning that Songwriting triggers creative activity

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<th>Key person</th>
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</tbody>
</table>

W: SongWriting, C: Song Creation, I: Illustration
Cluster 1

- Type
  - Centered
- Key person
  - Songwriting
- Majority
  - Illustration

Cluster 2

- Type
  - Messy
- Majority
  - Illustration
Cluster 3

- **Type**
  - Centered

- **Key person**
  - Illustration & Song creation

- **Majority**
  - Illustration, Song creation

The center of this cluster introduced a character called “Hachune Miku” (an infantilized version of the Hatsune Miku mascot) with leak.

Cluster 4

- **Type**
  - Messy

- **Majority**
  - Illustration
Cluster 5

- Type
  – Centered
- Key person
  – Illustration
- Majority
  – Illustration

Cluster 6

- Type
  – Centered
- Key person
  – Songwriting & Illustration
- Majority
  – Song creation
Cluster 7

- Type
  - Centered
- Key person
  - Songwriting
- Majority
  - Song creation

Conclusion

- We have investigated how different types of creators interacted in massively collaborative creation
- We extracted and analyzed the social networks of creators, revealing some interesting facts
  - Creator’s network is large and sparse
  - Different categories of creators have different roles in evolving the network
  - Creators’ behavior is similar to audiences’ one
  - Some of communities in the network are centralized, and some aren’t
Creation Activity: Songwriting

• Using *Vocaloid*, users can produce sound with vocalizations as computer music
  – It inspires amateur songwriters to publish their original songs with Hatsune Miku

Title: Vocaloid in love
Creator: Fuwa Fuwa Cinnamon

Title: Mikku miku
Creator: ika

Title: melody...
Creator: mikuru396
Creation Activity: Song Creation

- Certain techniques are necessary to tune Hatsune Miku, but it is fun to tune the software to create nice singing songs.

**Song creation**

- Title: Make It Sing
- "Make It Dance ‘Valalaika’"
- Creator: Asami

**Illustration**

- Title: Make It Dance
- ‘Valalaika’
- Creator: Soba allergy

| Aasami creates the video without songs, then Soba allergy tune and new video with the song |

**Valalaika**

- (Professional artist’s song)

Creation Activity: Illustration

- The image of Hatsune Miku is a typical anime character and attracts anime fans.

**Illustration**

- Title: melody...
- 3D PV ver1.50
- Creator: ussy

**Songwriting**

- Title: melody...
- Creator: mikuru396

| ussy creates the video for the original song ‘melody...’ created by mikuru396 |
Creation Activity: Editing

• There are so many Hatsune Miku videos that some people collect them and produce summary videos, with ranking programs of Hatsune Miku videos

Title: Best choice!
Hatsune Miku Medley
Creator: LarK