

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' 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

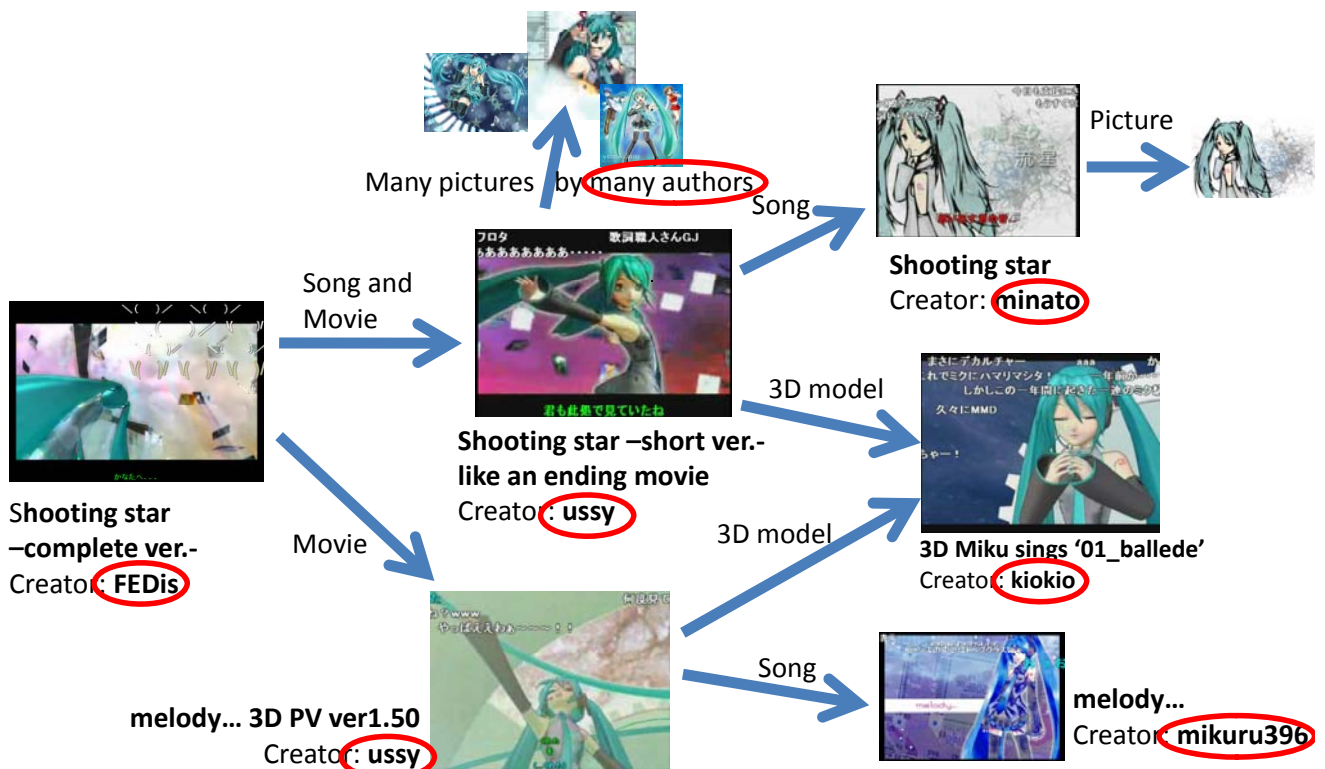
- A lot of video related to “Hatsune Miku” are posted to a video site (“Nico Nico douga”)
- It’s really Massively Collaborative Creation of Multimedia contents
 - Massive Participation: *Yes*
 - Thousands of people create tens of thousands of videos
 - Collaborative Creation: *Really Yes!*
 - Sharing and **Re-using** of digital contents
 - Multimedia: *Really Yes!*
 - Sounds (songs and music), pictures (2D & 3D), movies

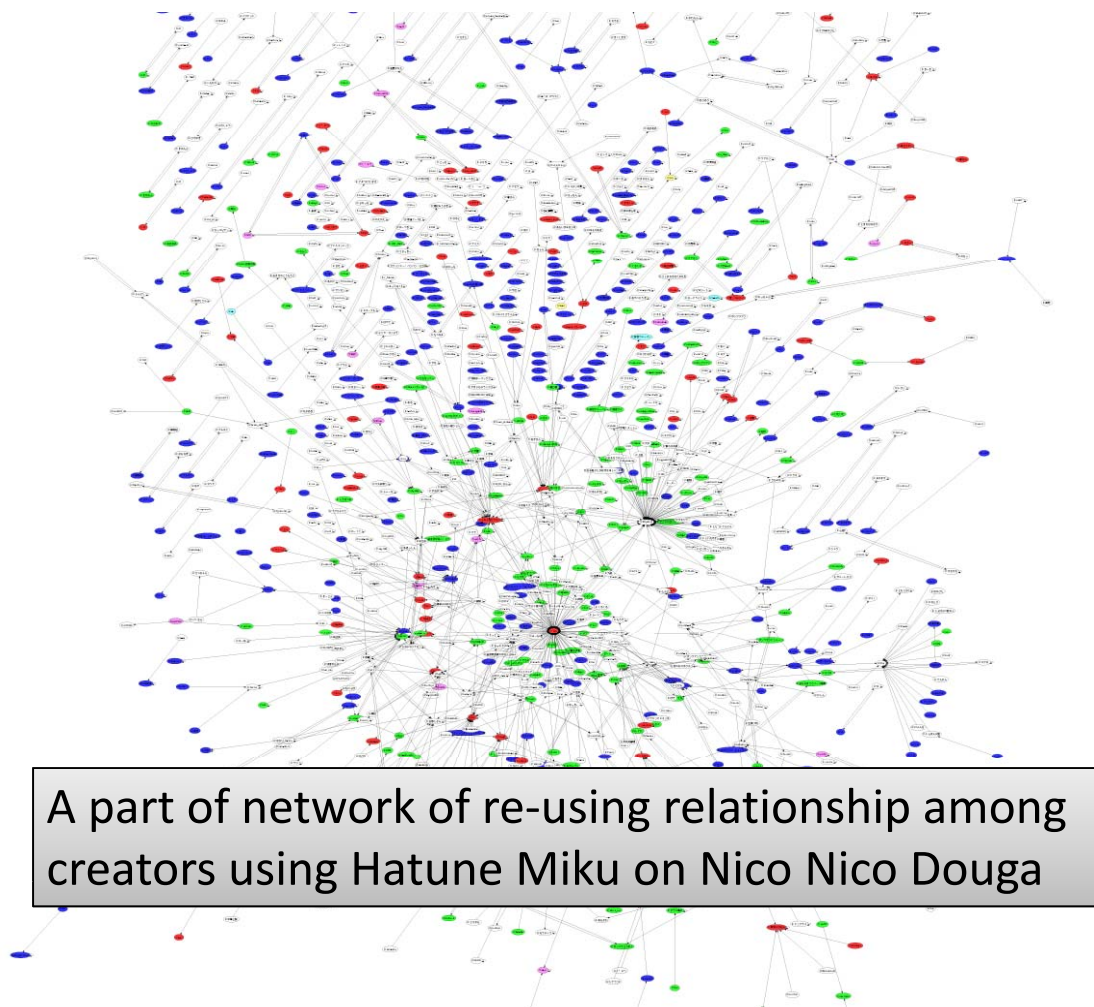
Example!!



- 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





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
 - It has inspired many people to produce various **music**, **picture**, and **video** compositions

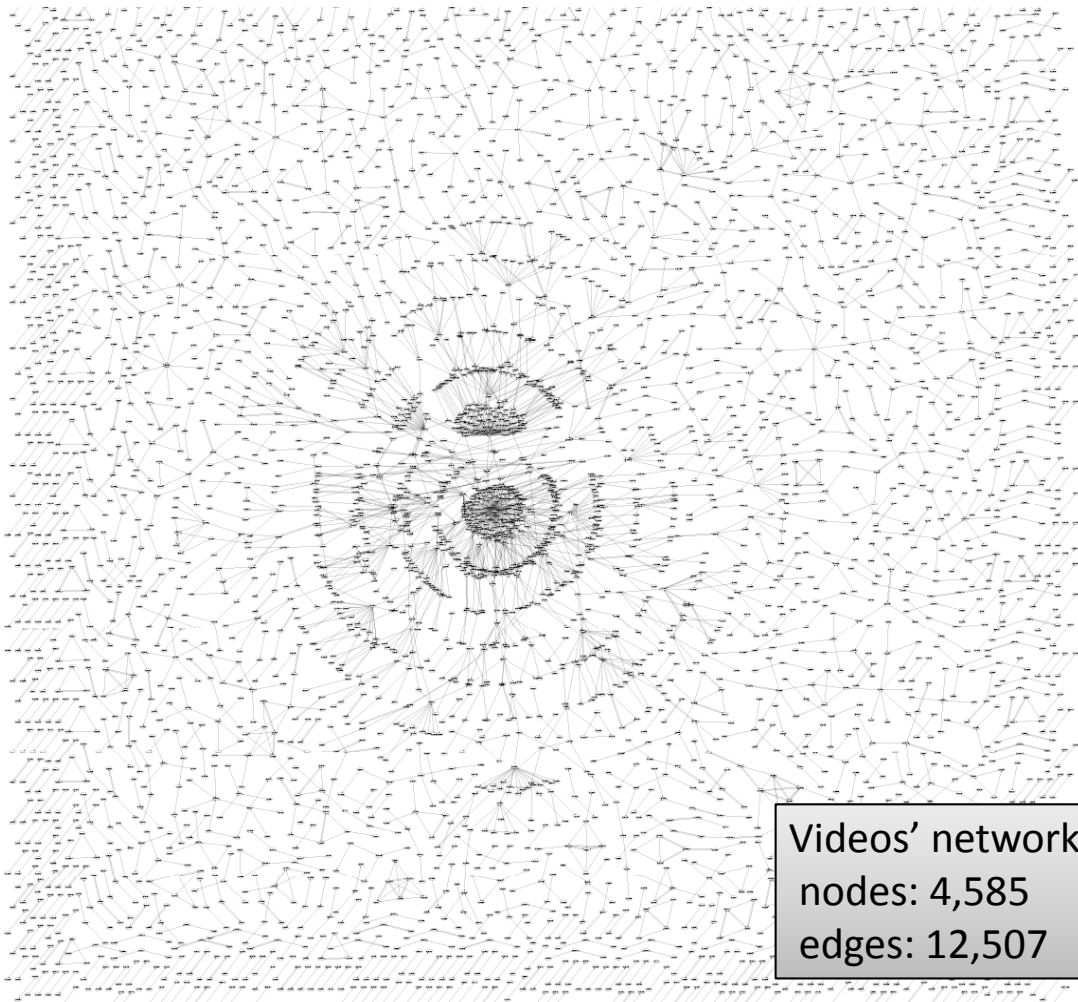


Data Collection

- 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 vide

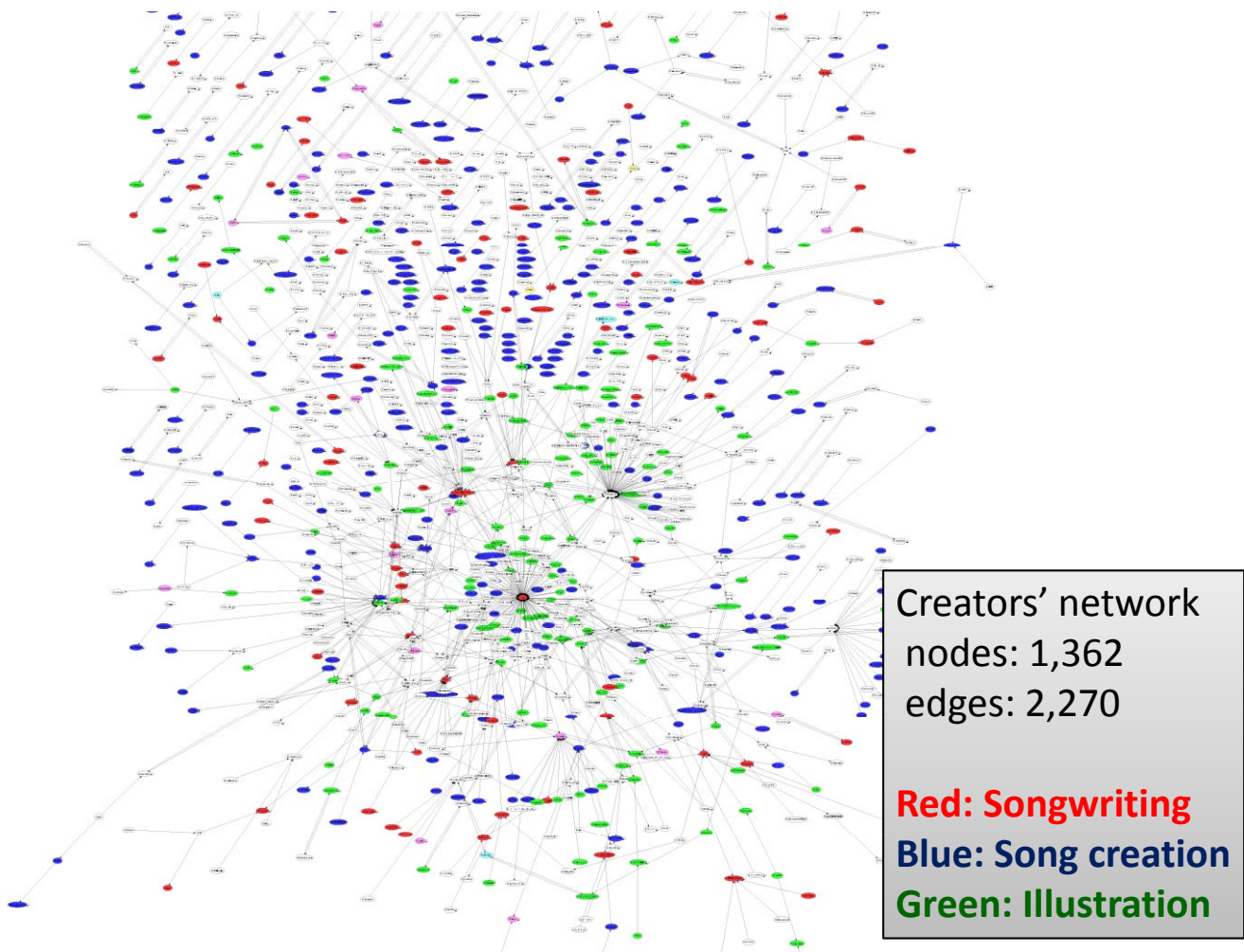
How to make video's network

- 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**

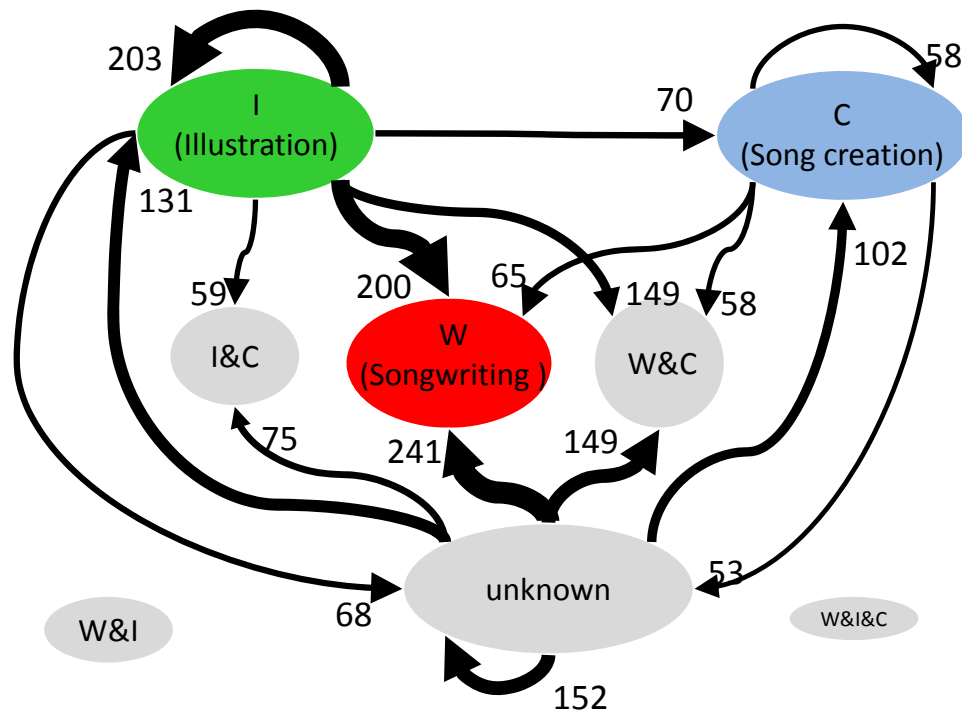
Category of Creation Activity

- 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

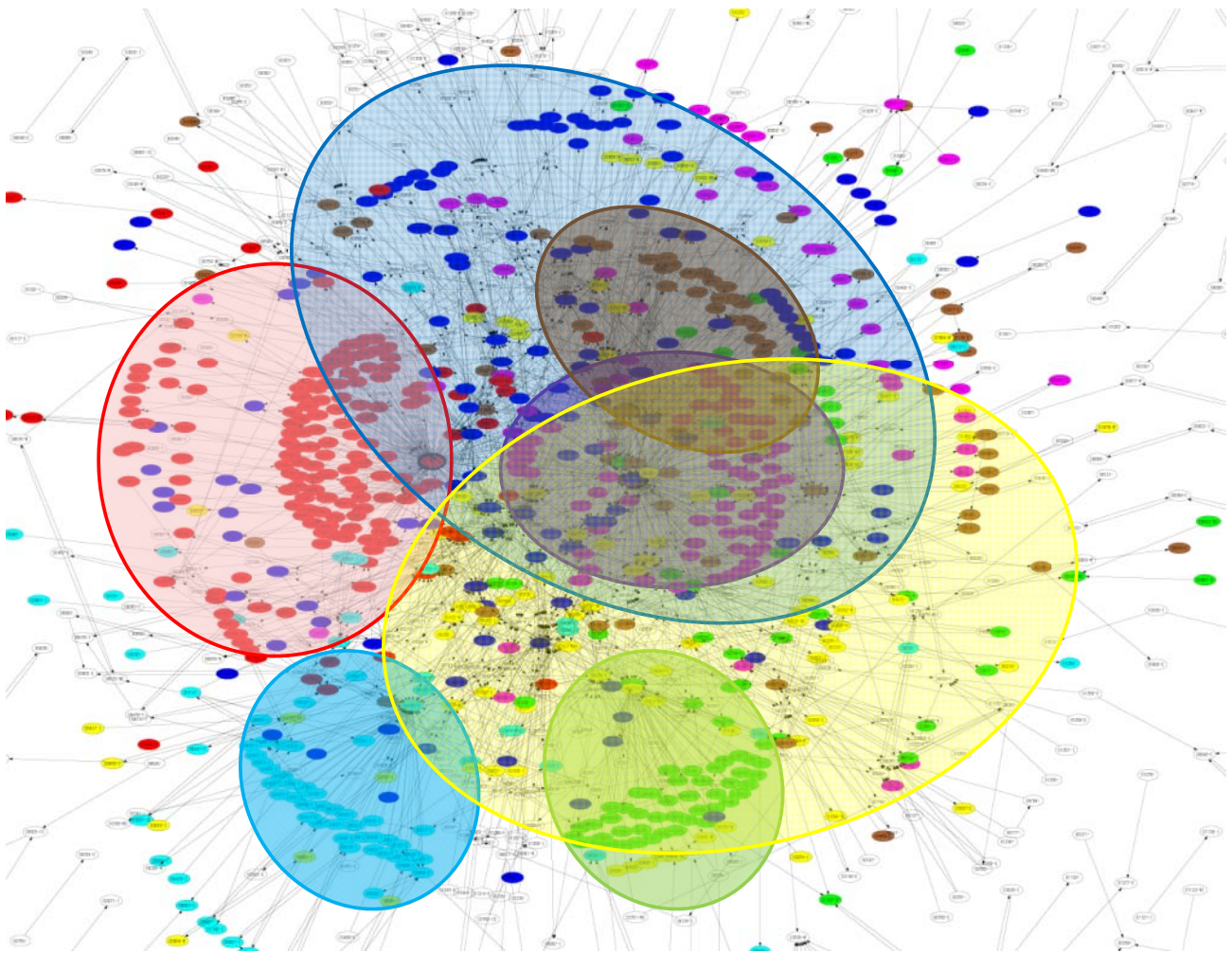
- Classify videos and creators into creation categories automatically using tags for videos
- Provide a set of tags that are important for specific creation categories.
 - Ex. Tag “Miku Original Song” -> **Category “Songwriting”**
 - Ex. Tag “3D Hatsune Miku Project” -> **Category “Illustration”**
- 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

Relationship among categories of creation



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

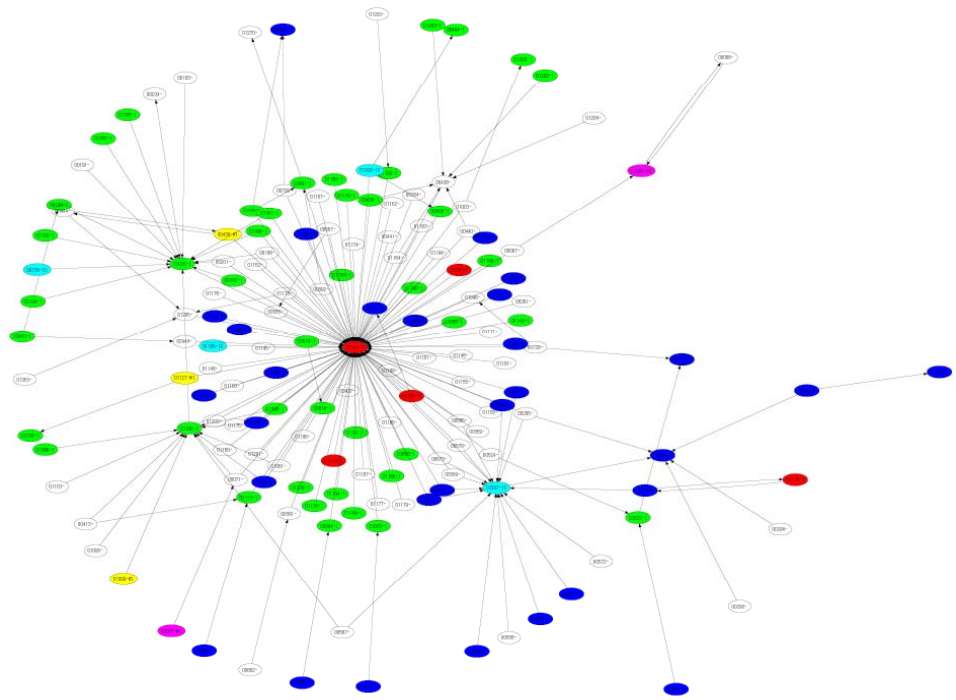
- Songwriting is often a key person, meaning that Songwriting triggers creative activity

| | # | Size | Type | Key person | Majority |
|---|----|------|----------|------------|----------|
| ● | 1 | 161 | centered | W | I |
| ● | 2 | 144 | messy | – | I |
| ● | 3 | 118 | centered | I&C | I, C |
| ● | 4 | 95 | messy | – | I |
| ● | 5 | 91 | centered | I | I |
| ● | 6 | 90 | centered | W&C | C |
| ● | 7 | 79 | centered | W | C |
| | 8 | 56 | messy | – | C,C&I |
| | 9 | 55 | centered | W&C | C |
| | 10 | 51 | messy | – | I |

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

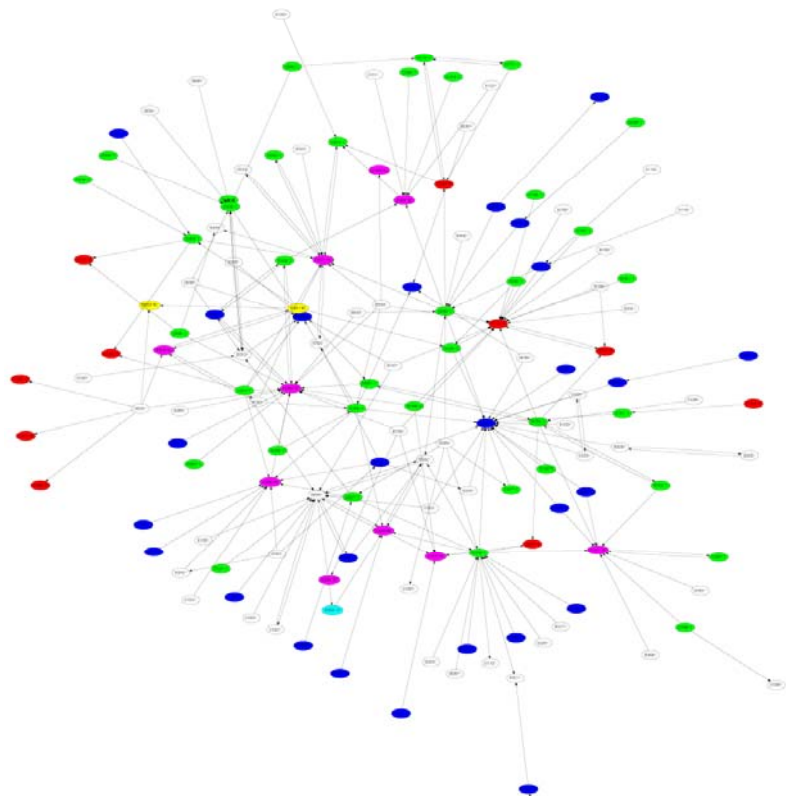
Cluster 1

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



Cluster 2

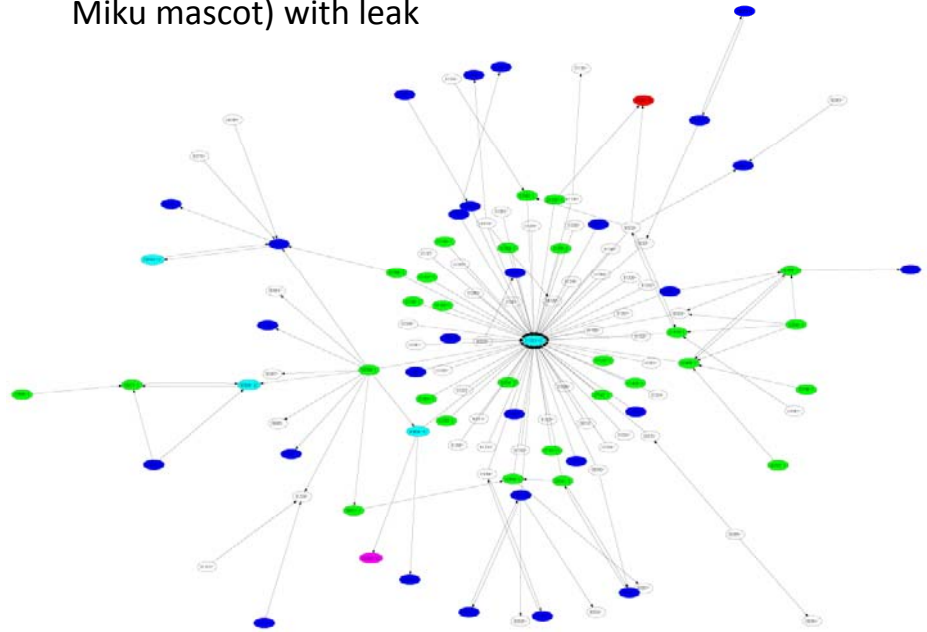
- Type
 - Messy
- Majority
 - Illustration



Cluster 3

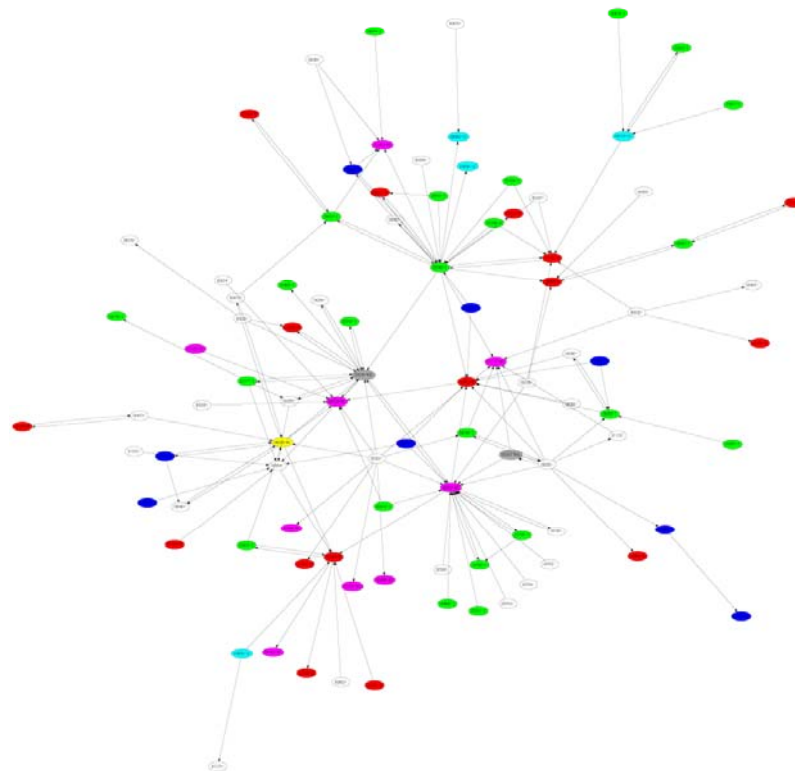
- Type
 - Centered
- Key person
 - Illustration & Song creation
- Majority
 - Illustration , Song creation

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



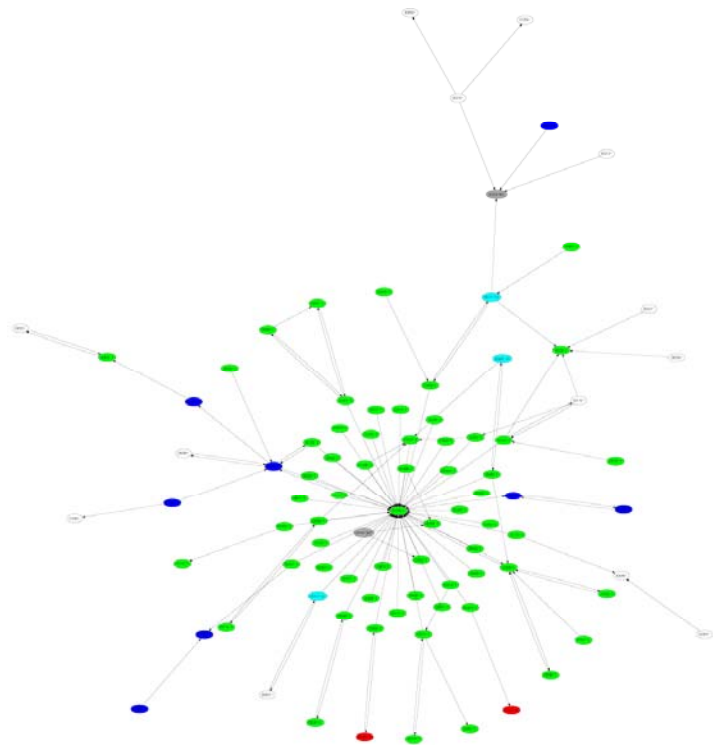
Cluster 4

- Type
 - Messy
- Majority
 - Illustration



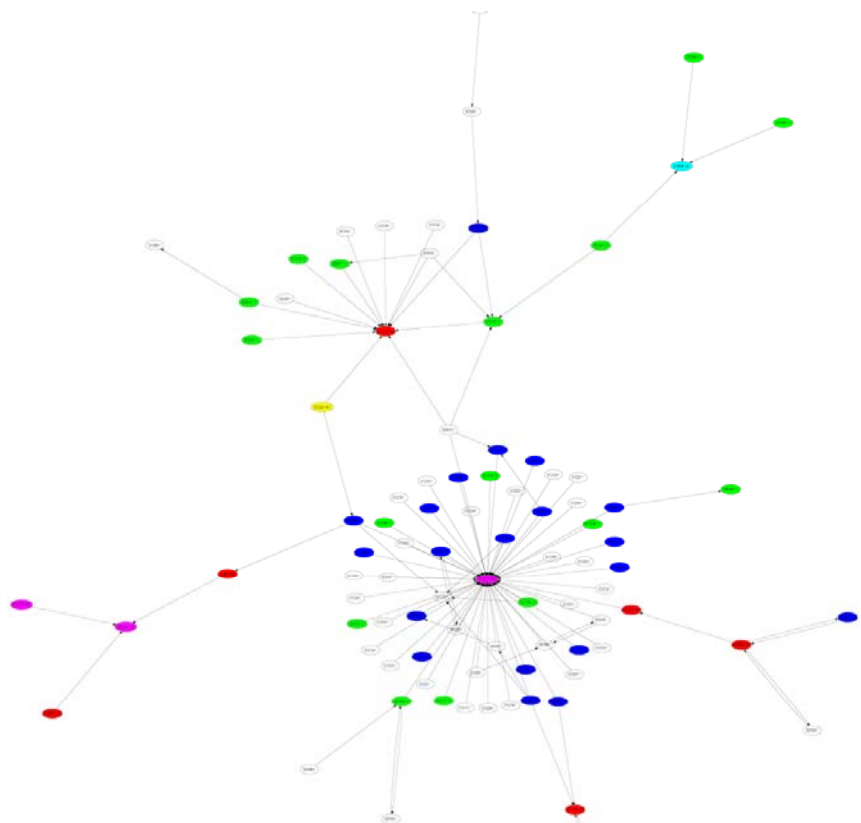
Cluster 5

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



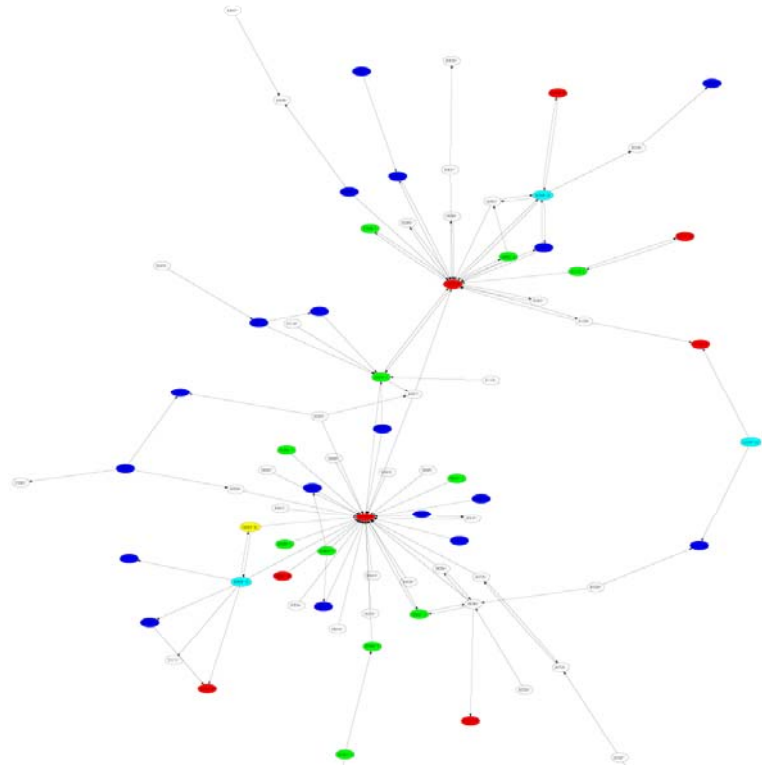
Cluster 6

- 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

Songwriting



Title: **Vocaloid in love**
Creator: **Fuwa Fuwa Cinnamon**

Songwriting



Title: **Mikku miku**
Creator: **ika**

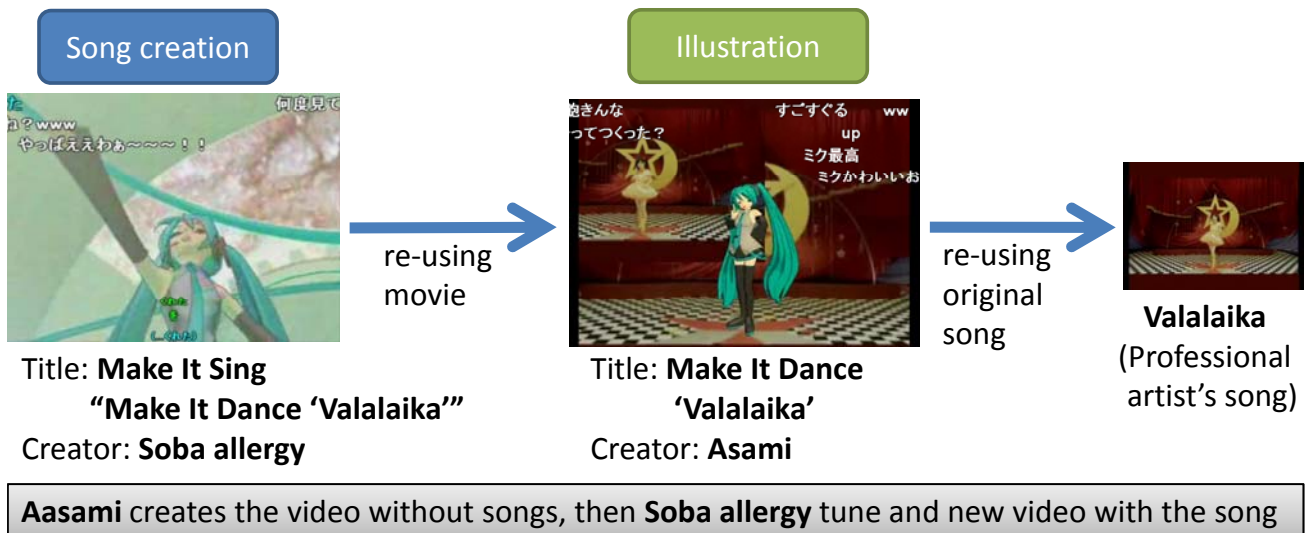
Songwriting



Title: **melody...**
Creator: **mikuru396**

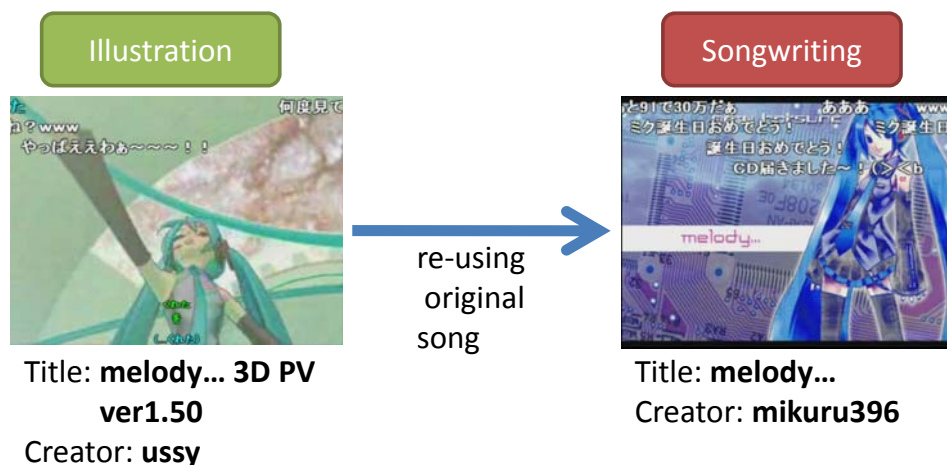
Creation Activity: Song Creation

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



Creation Activity: Illustration

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



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

