Lights, Animation, Interaction!
Synchronizing Music with Computer-controlled Visuals in Live Performances

Society for Animation Studies 34th Annual Conference, 6/12/2023

Jun Kato
National Institute of Advanced Industrial Science and Technology (AIST)

1. Introduction

**Lights, Animation, Interaction!**
Synchronizing Music with Computer-controlled Visuals in Live Performances

Jun Kato (AIST)

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Human-Computer Interaction researcher studying creative activities e.g., programming, video authoring, storyboarding through building and deploying creativity support tools

In short, I am a “toolsmith” for creators including animators

The University of Tokyo Igarashi Lab ’09 BSc, ’11 MSc, ’14 PhD
Microsoft Research Asia ’12/1-4 Research Intern / Microsoft Research ’12/6-9 Research Intern
Adobe Creative Technologies Lab, Seattle ’13/8-11 Research Intern
National Institute of Advanced Industrial Science and Technology (AIST) ’14/4- Researcher, ’18/10- Senior Researcher
Arch Inc. ’18/7- Technical Advisor (PI at R&D unit Arch Research)

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Past, Present, and Future of Storyboarding in Japanese Animation

Jun Kato, Ryotaro Mihara, Nao Hirasawa (Arch Inc.)
SAS 2021 (Animated Energies), Online, June 15

https://research.archinc.jp/en
Missing feature in E-Conte: collaborations

- The “story corkboard” part is completely missing
- Storyboarding process has usually been handled secretly by a director and not shared with others until its completion


June 12, 2023
Lights, Animation, Interaction! (SAS 34)
Past, Present, and Future of “Toolsmiths” in Japanese Animation

Jun Kato (Arch Inc.)
in collaboration with Yuki Koyama (Graphinica Inc.), Tatsuo Yotsukura (OLM Digital, Inc.), and Koya Imamura (Toei Animation Co., Ltd.)

SAS 2022 (Animation Unlocked),
Hybrid (Middlesbrough, UK & Online), June 29

https://research.archinc.jp/en
Three case studies
in the dawn of computer-aided animation

New York Institute of Technology Computer Graphics Laboratory

Japan Computer Graphics Laboratory

Toei Douga Co., Ltd. (Toei Animation Co., Ltd.)

NYIT example image from https://blog.siggraph.org/2020/08/pioneering-pixels-the-nyit-computer-graphics-lab-then-and-now.html
JCGL logo from https://note.com/nahnah/n/ne7e3043c6fe
Toei Animation logo from https://corp.toei-anim.co.jp/ja/company/about_pero.html
Our research question

Many studies of animation begin with a question about the object—what is anime?—but I suggest a different entry point: Who makes anime?

Ian Condry, “The Soul of Anime,” p.3

We pose yet another entry point—our research began with exploring the design space of building creativity support tools for anime production studios, which can be summarized as: how to make anime?
TextAlive
Integrated Design Environment for Kinetic Typography

publicly available at https://textalive.jp

Jun Kato, Tomoyasu Nakano, Masataka Goto
SANRIO Virtual Festival 2023
Jan. 13-22, 2023
https://textalive.jp/events/sanrio-v-fes2023
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Jun Kato at 32nd and 33rd SAS Annual Conferences

We have provided a new creativity support tool to author lyric videos, which has been used in production, such as live music performances enjoyed by more than 30,000 audiences—how do the “animating lights” contribute to the performances?
2. What is live music performance?

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Section 8-3. Role of Stage Lighting

8-3. 舞台照明の位置づけ（p.87）

- Stage lighting is a part of the performance, not a work in itself.
  舞台における照明はその舞台作品の一部分として位置づけられるのであり、照明単独で作品となるわけではない。

- If the lighting on stage pops out prominently, it is a “lighting show” and not the real stage lighting.
  舞台照明が目立って飛びだしていたら、それは「ライティングショウ」であって、本当の舞台照明ではないのです。（『舞台照明』大庭三郎 1976 p.5）
Section 8-3. Role of Stage Lighting

8-3. 舞台照明の位置づけ（p.87）

• Given that lighting on stage is a part of the performance, to design lighting, one must understand the intention of the artistic production holistically.

照明が舞台作品の一部分を成すのだとすれば、照明を作るためには、その舞台作品全体の意図を理解していかなければならないはずです。

• Stage lighting without a good understanding of the main body of the play, dance, musical, etc. being performed results in the stage simply be lit, but not a true (artistic) picture of light.

ここで最も大事なことは、舞台照明とは演劇・舞踏・ミュージカルなど上演されるその本体をよく理解していかなければ、舞台に単なる光が出ても、本当の光の絵にはならないむずかしさがあることです。（『舞台照明』大庭三郎 1976 p.12）
Theatrical performance lighting is based on the script, which creates the stage scenes in accordance with the story.

Concert lighting needs to be based on the music to be performed, therefore challenging the imagination.
• In theatrical performance lighting, lighting sources such as spotlights are usually hidden from the audiences.

• 演劇での舞台照明では、基本的に光源となるスポットライトなどの照明器具が、観客から見えないようにセッティングされています。

• In concert lighting, the sources are part of the stage sets; not only their existence is visible, but their animations are part of the expressions.

• コンサートではスポットライトなどの照明器具も、ステージセットの一部と考えられてステージがつくられています。また、光源としての照明器具の灯体はもちろんのこと、明かりの動きや点滅などを直に観客に見せ、これを表現のひとつとして使用しています。
Live music, stage, and lighting as “the animated environment”

• [p.100] When sound and light are synchronized, the sound is created by the musicians and sound staff, and the light is created by the lighting staff, but the audience does not perceive them separately. The audience perceives the entire synchronized sound and light as “one event” (with a certain kind of “reality”)

• [p.100] 音と光が同期している時、実際には音はミュージシャンと音響スタッフが、光は照明スタッフがつくりだしているのですが、観客はそのように分けては捉えません。観客は音と光が同期した全体を「一つの出来事」として受け取ります。

[p.8] The stage where the light source of the luminiaire becomes part of the design

[p.8] 照明器具の光源がデザインの一部となったステージ

June 12, 2023

Lights, Animation, Interaction! (SAS 34)
3. Full-color pixels: from abstract to concrete
Pixels on the stage

• Conventional stage lighting devices such as spotlights can be regarded as **huge and bright pixels**, which used to be static, and their intensity was the only parameter to be controlled.

• Concrete images can be projected using “**Gobo**”, and their motion became controllable with the **Vari-Lite** debut in **1981**.

• Digitally controlling protocol **DMX512** became generally available in **1990s**.
Digitization of lighting design

• After the standardization of the **DMX** protocol, lots of lighting simulation/controlling/programming software appeared

• DMX can handle 512 8-bit channels, but can easily fall in short when controlling complex lighting devices these days

Lighting sources in the post-digital era

- **LED lighting sources** can change their colors quickly
- **LED displays and projectors** can play videos synchronized with music
- **Glowsticks** enable active participation of the audiences
LED displays: from abstract lighting to concrete animations

- [p.144] Sometimes more can be conveyed by videos, and depending on the performed music, the stage features the video, regarding conventional lighting as support. … We believe that a total direction method that is conscious of the overall visuals, including lighting, video, and stage set, will be more required in the future.

- [p.144] 映像による表現の方がより多くのことを伝えられる場合もあり、演奏される曲目によってはステージの表現を映像をメインにし、ライティングはサポートのような表現になることもあります。これからはライティング、映像、ステージセットと全体的なビジュアルを意識したトータルな演出の方法が、より求められてくると思います。
Glowsticks, wristbands, and smartphones: from the passive to active audience

• The audience can wave glowsticks, wear wristbands and hold smartphones automatically changing colors to music
• We even allowed the audience to interact with the animations played on the smartphones [Songle Sync, 2018]

https://magicalmirai.com/10th/goods_nic_penlight.html
Xylobands. https://xylobands.com
Wham City Lights. https://vimeo.com/86363873
ACM Multimedia 2018 (Oral presentation)

A Large-Scale Web-based Platform for Controlling Various Devices in Synchronization with Music

publicly available at https://api.songle.jp-sync

Jun Kato, Masa Ogata, Takahiro Inoue, Masataka Goto
4. Role of “Animators”

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Virtual stages: Musical performances in post-COVID19 era

MIKU LAND 2023
New Beginning
Happy Coaster / emon (Tes.) feat. Hatsune Miku
https://textalive.jp/events/mikuland2023
Lights, animation, interaction! – or the information overload for the audiences?

• Computers are controlling **lights, animation, and interaction** for more immersive and active music listening experiences

• The role of animators will be to combine these technical elements to build **the animated environment** surrounding the audience
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Songle Sync was used to enable this interactive performance held at Magical Mirai 2019.
https://junkato.jp/songle-sync
https://youtu.be/dCmlEwDTkDY

TextAlive was used to produce the lyric video for the MIKU LAND 2023 attraction.
https://junkato.jp/textalive
https://textalive.jp/events/mikuland2023