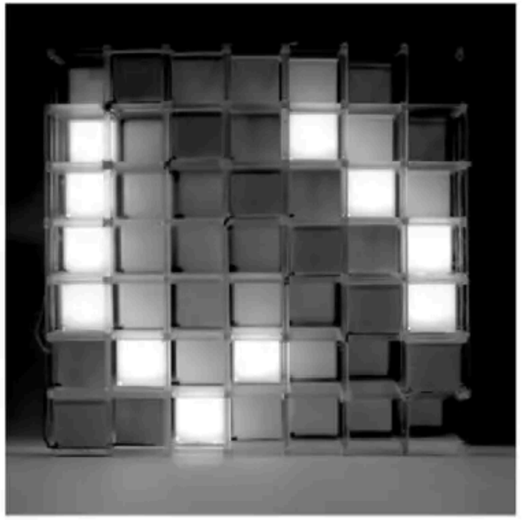




Robotype:

Studies of Kinetic Typography by Robot Display for Expressing Letters, Time and Movement

by Yuichiro Katsumoto

科技藝術書報討論
107004502 吳柏瑤

Robotype 3

by Yuichiro Katsumoto

Abstract

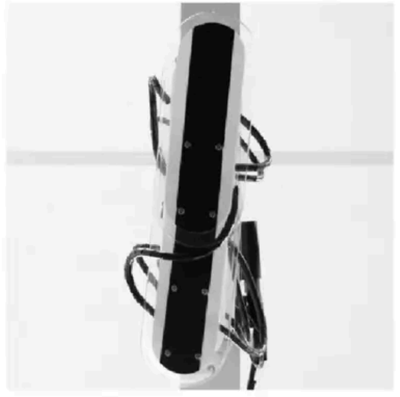
- Letters are two-dimensional static symbols for communication
- **Letter is a trajectory 軌道、彈道、軌跡 💫 of movement and time**
- Writing these letters requires **body movement** as well as **spending a certain amount of time**

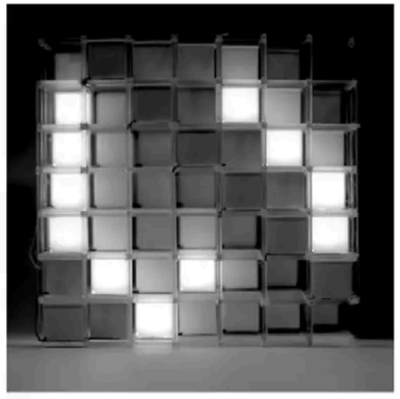
👇

- the author conducted studies regarding
  - **multidimensional kinetic typography**
  - using **robots** to display a letter and **visualize its time and movement simultaneously**.

👇

- This paper describes the **project background** and design of the **three types of robotic displays** that were developed and discusses possible expressions using robotic displays.





Abstract

- Letters written on paper can be retained almost indefinitely.
- The **movement and time** spent by the writer are usually apparent in the brush or pen **stroke** of the letter. The **shading, blurring and density of ink** demonstrate the behavior and movement of the writer over time; one can deduce 演繹 the writer's **emotion or thought**. Thus, our letters are not only two-dimensional symbols that convey messages, but also **involve the time and movements that humans devote toward communication**.

✨

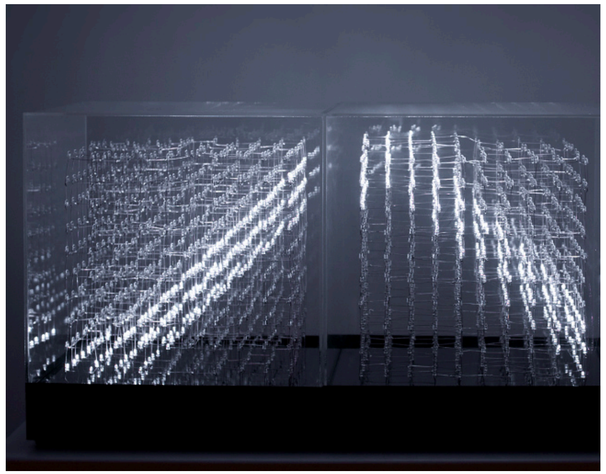
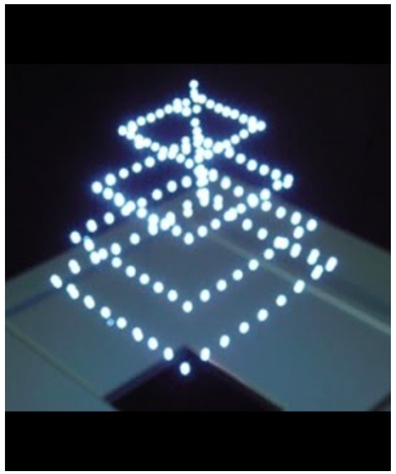
- The time and movement observed in handwriting have not been regarded as important for letterpress printing.
- **Obtain a display technology for letters that coexists with time and movement beyond the two-dimensional plane?**
- **multi-dimensional display for kinetic typography**
  - robot technology
  - the illusion of depth

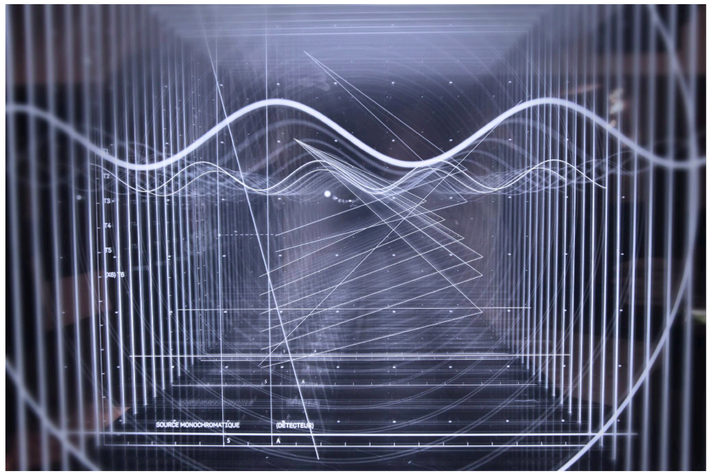
✨

1. **Sujigen** for displaying Arabic numerals
2. **Mojigen** for the Roman alphabet
3. **7×7** for double-byte characters such as Japanese

Background Multi-Dimensional Display

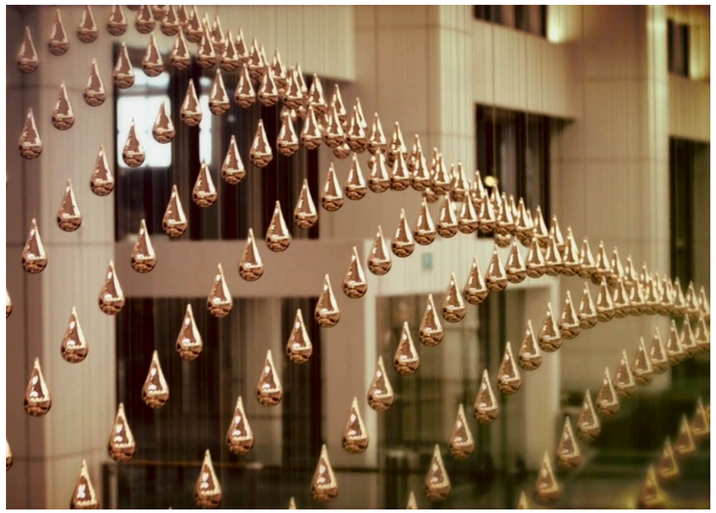
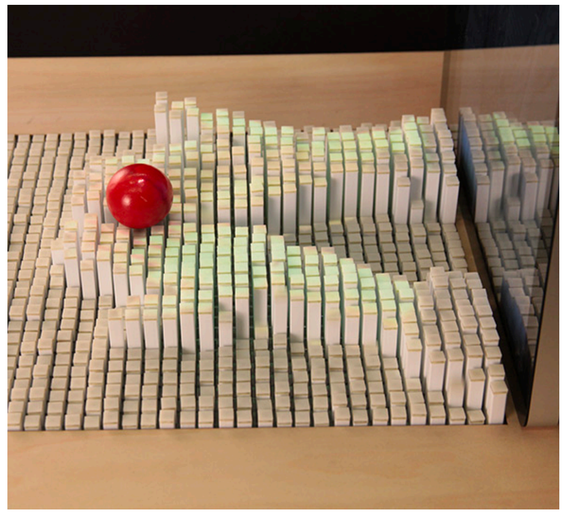
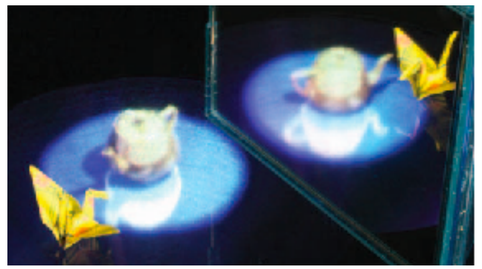
- **LED matrix cube**
  - J.Clar, “3D Display Cube” (2003)
- **Laser Produced 3D Display in the Air**
  - H. Kimura, “Laser Produced 3D Display in the Air” (2006).
- **LED strip**
  - J.N. Sears, “The Orb” (2008).
- **Superimposing transmissive planar displays**
  - Y. Sudo, “YS-3: Multi-Layered Interactive Animation Device” (2008)
  - N. Bernier, “Frequencies (Light Quanta)” (2014)

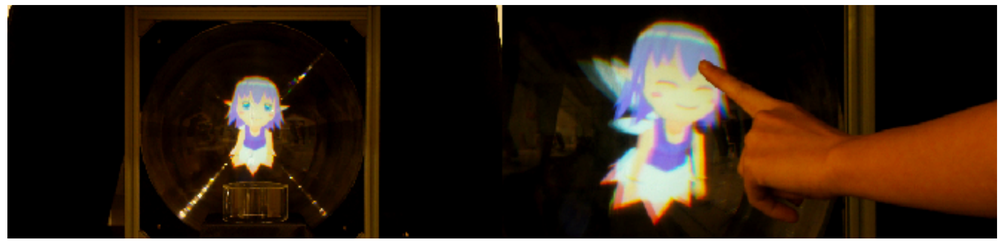





Background Multi-Dimensional Display

- **Physical objects as a voxel**
  - ART+COM, “Kinetic Rain” (2012)
- **Three-dimensional patterns using an array of hanging weights controlled via motors**
  - IS. Follmer et al., “inFORM” (2013)
- **Three-dimensional shapes using a grid of linear actuators 促動器**
  - H. Nii et al., “ Fuwa-Vision: An Auto-Stereoscopic Floating-Image Display” (2012)
  - S. Yoshida, “fVisiOn” (2015)

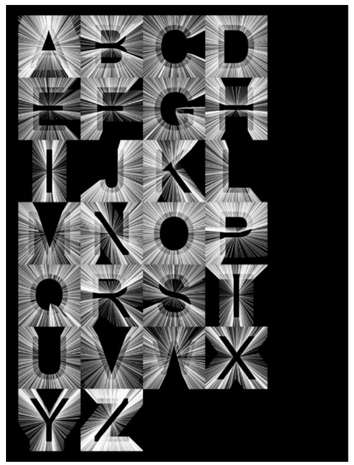




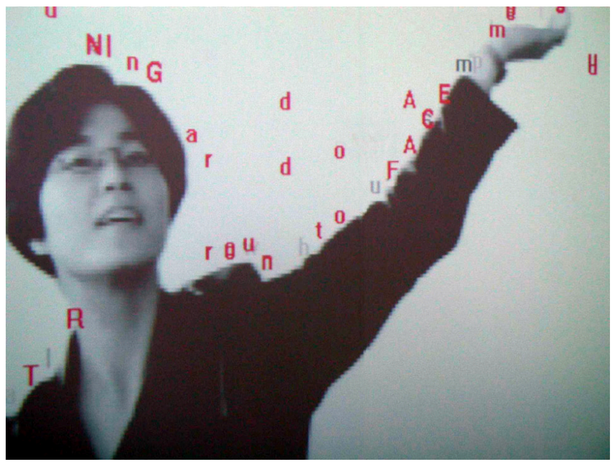


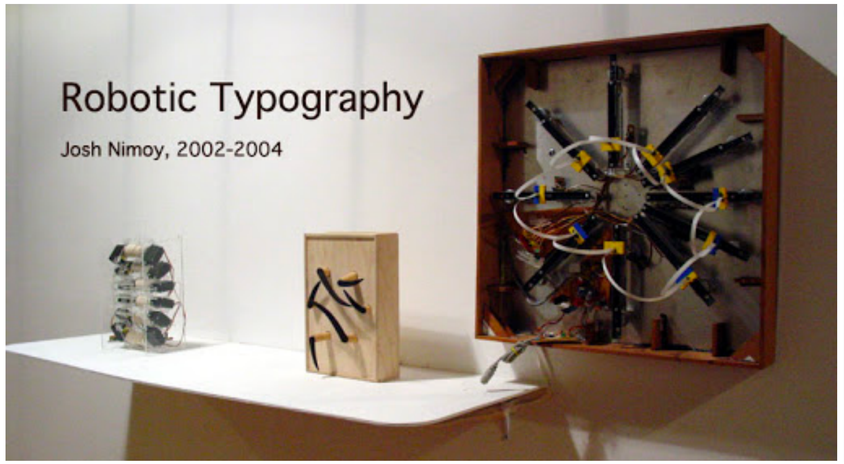
Background Kinetic Typography Using Computer

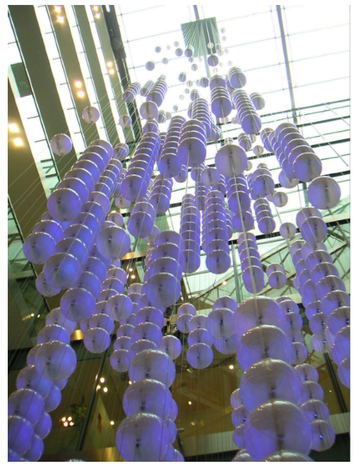
- Advantages of computational typography

1. Letter generation and movement through **human–computer interaction** or **coding** itself
   - **Algorithm**
     - Y. Ahn and G. Jin, “TYPE+CODE II: A Code-Driven Typography” (2016)
   - **Interaction between poetry and the user’s entire body**
     - *Text Rain* by Camille Utterback
2. Enabling **physical materials** to become computational displays via DA converters 數位類比轉換器 and actuators.
   - **Letters and numbers are displayed by mechatronics**
     - J. Nimoy, “Robotic Typography” (2002–2004)
     - Greyworld, “The Source” (2004)









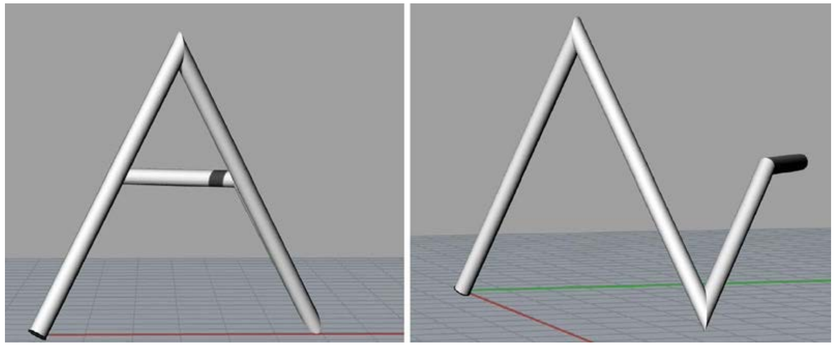
Background Kinetic Typography Using Computer

- **Letters and numbers are displayed by controlling natural substances**
  - water - J. Popp, “Bit.Fall” (2001–)
  - bubbles - B. Shapiro, “Pipedream” (1999–2006)
  - moss 苔藓 - T. Kimura and Y. Kakehi, “MOSS-xels” (2014)
  - fur - Y. Sugiura et al., “Graffiti Fur” (2014)

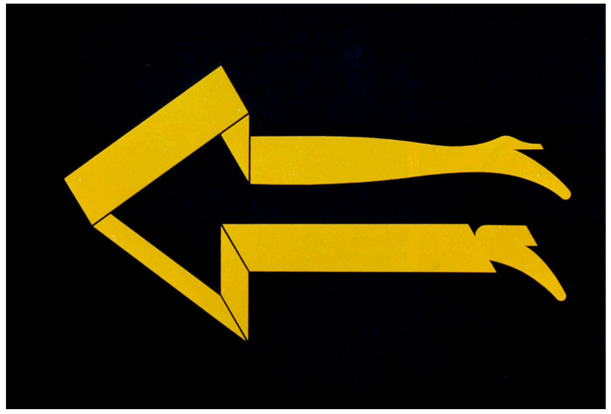


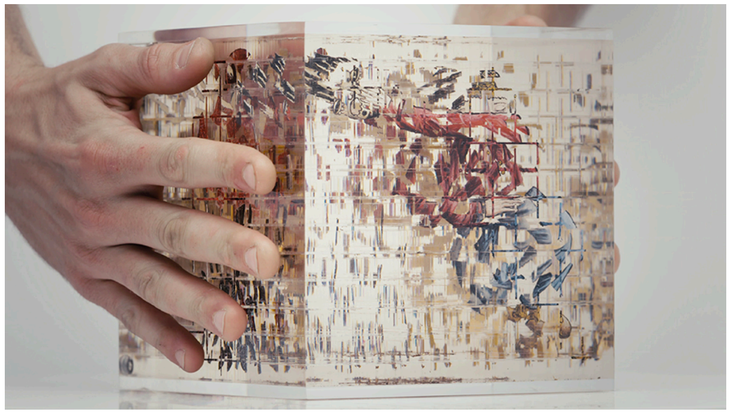
Principal Concept of the Robotype Display

- A string is deformed by **actuators**, the string is observed as the letter (A) from the front view.
- Simultaneously, the **trajectory of time and movement** can be observed from other points of view.



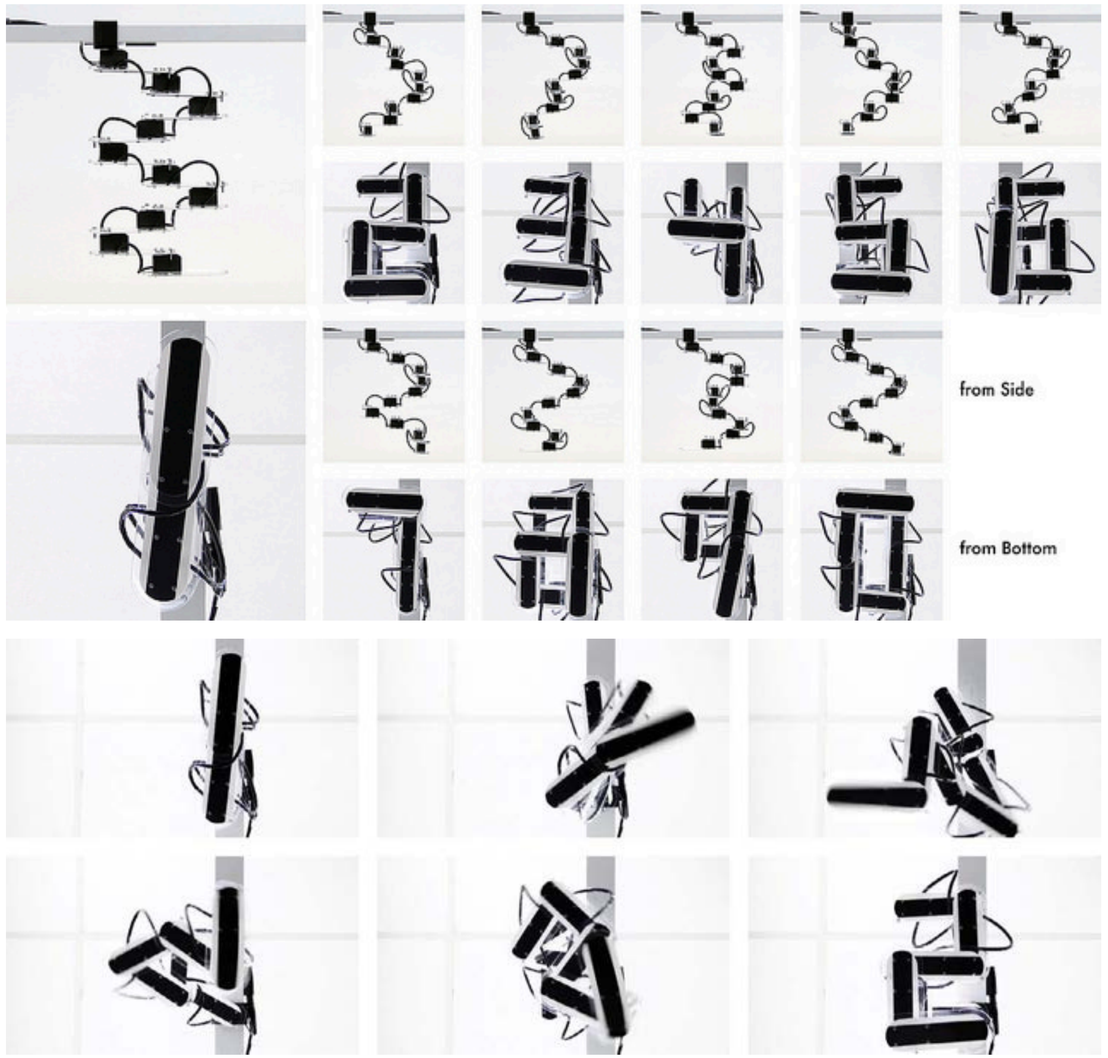
- **Optical illusion of depth**
- Express the **dynamic strokes as a live animation** + **trajectory of the strokes**.





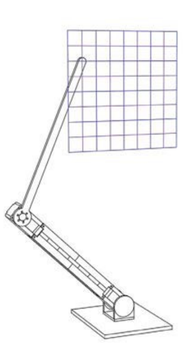
Sujigen

- **Seven-segment display**
  - straight lines + right angles
- **Materials**
  - Long robot arm with 10 segments
  - Servo : set to 0°, 90°, 180° and 270°
  - Hangs from the ceiling
- **Displays**
  - Rotating each segment simultaneously
  - **written in a single stroke**.
  - the **trajectory** of the transition **between the numbers** can be visualized
- Theoretically
  - possible to display numbers with eight segments
  - avoid unattractiveness caused by parallax of its depth
  - maintain the weight balance of the kinetic mobile



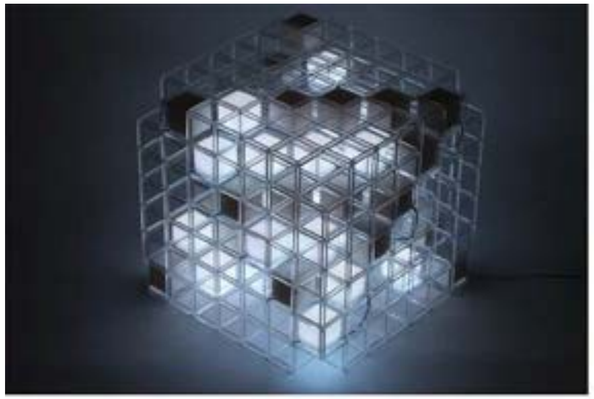
Mojigen

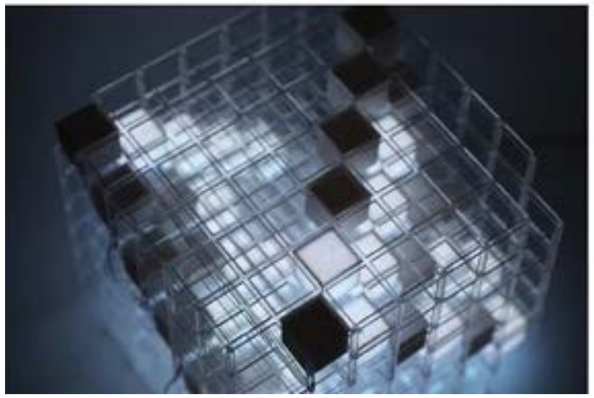
- **Vector Scan Display**
  - using the trajectory of a rapidly moving beam 樑.
- **X** rasterize images
  O expresses a line as a pure line
- **Materials**
  - robot arms
  - transparent acrylic boards
  - coil springs
- Length / Angle / Torque
- **Display**
  - Moving each robotic arm to a preset position
- Letters are displayed to the front
  with the **trajectory** of the movement and the
  elapsed 消逝 time observed from other directions.
- 3 sec to display one letter
  overheating

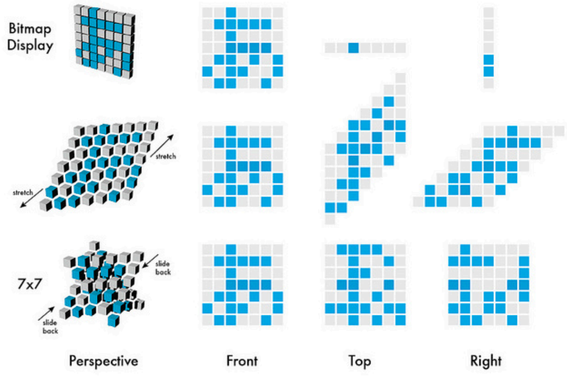


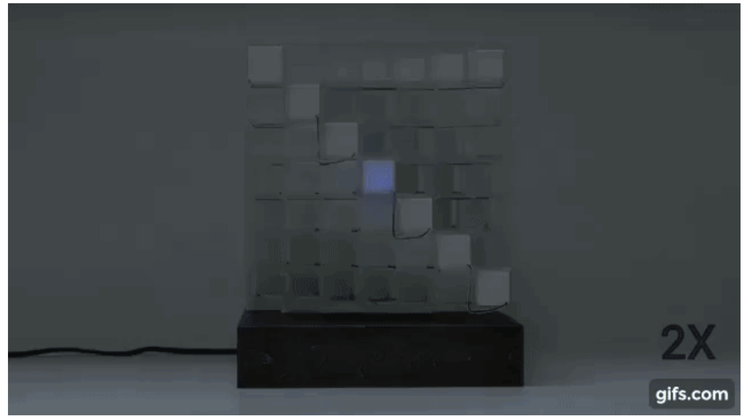
7×7

- **Bitmap**
  - split letter like “**i**”
  - complicated curved letter like “**ξ**”
- **Materials**
  - The 7×7 consists of 49 voxels
  - white ABS cubes
    - full color LEDs
    - wired to a micro-controller
- **Display**
  - displays 49 characters Japanese characters
  - referred to Misaki Gothic
    - license-free computer font
    - used primarily for dot matrix
  - **<u>In 7×7, they are arranged that no voxel overlaps in any direction.</u>**









Discussion

- Robotype is a computer display that allows letters to **coexist with time and movement in physical space**.
- Robotype can display words with the **associated emotion intact**. ex. speed of movement, font size
- Poets and Novelists to be able to **interactively manipulate** Robotype
  since it can materialize the artist's emotions in real time.

- acrylic distortion + heat accumulated in the motor
- Daily changes to Robotype behavior
- **regard this in the same manner as ink**.

- **FutureWorks**
  - increase the number of displays
  - express **poetry and haiku**
    while considering **time and movement**