# Technical Addendum on ***This May Not Be a Movie***

By **Kazuhiro GOSHIMA** (translated by **Joon Yang KIM**)

## How I got engaged in making this work: Reverie of a fictional history of technologies

In 2012, a 'simple' question was raised at a colloquium: "What is the definition of animation?" Given that a fundamental principle of animation (and cinema) is to 'show motion by a succession of still pictures' in terms of a conventional way of understanding the medium, is it possible that puppet play or silhouette theater, for instance, are classified as animation? How about robots controlled by the computer system in an amusement park? I remember that those present at the colloquium furthermore discussed the following question: Is a robot a kind of animation if it were controlled frame by frame?

It was at that time that I began to think if there could be any 'moving image not relying on frames' . My question was how to inscribe the change of an 'image' taking place through time.

I conceived of some ideas of the moving image that does not (seem to) rely on the notion of 'frame', for instance;

- Might there be anything potential with a vector scan display?
- Would it be possible to mechanically control an animatronic attraction of an amusement park by means of cams, etc., or in any other modes than time-coded?
- To control the movement of each pixel on the pinscreen with an electromagnet or something like that, with the signal of control recorded on a magnetic tape using analogue techniques.
- To make a 'time-based 3-d Kintaro-ame' by solidifying continuously a vat of liquid UV curable photopolymer resin (used for today' s 3-d printing technologies) on the object-glass surface at the same time when controlling the height of the elevator platform on which layers of resin are solidified. For playback, we can see the succeeding sections as a moving image through CT scanning or shaving (the moving image is recorded as a three-dimensional form!). **(Fig. 01)**
- To adopt the CoDec of digital video that encodes the change of the brightness of each pixel as a waveform. **(Fig. 02)**

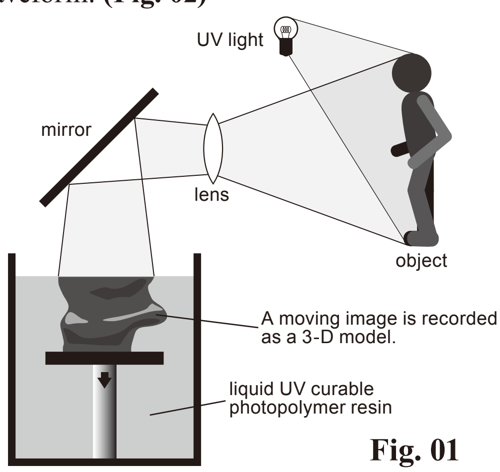


**Fig. 01**

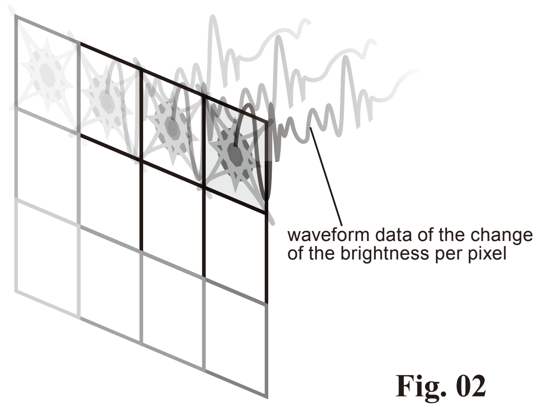


**Fig. 02**

The last idea led to envisioning ‘a bundle of waveforms of the same number as the pixels of which an image is made up’ . Developed from this, a basic concept of my work is to record the change of light resolved by the pixel on an analogue medium (specifically, photographic film).

I have thought of ‘cinema’ as a medium in which the digital is inherent in that it samples still images at intervals. My intuition was that focusing on and developing such digitality could lead to the realization of a moving image without frames, by means of slice sampling in a non-temporal dimension and a simple conversion of light information.

Drawing on this principle, my work, ***This May Not Be a Movie***, is a system composed of already-available devices like optical fibers, a large format of reversal film, a twin-lens reflex camera, and a unit of ball screw driven slide, which records and plays back a new type of moving image that differs from the existing cinema/moving image. An initial purpose of the work was to demonstrate the possibility of a moving image without frames and its process of production and projection. While making the demonstrator, however, I found possibilities of improving its performance.

I suspect that a similar system to my work might have ever been invented, not only enough well documented, as this is actually based on a truly simple principle (indeed, it is built with much simpler devices than cinema, for example, not requiring the complicated link mechanism for intermittent motion). Nonetheless given that it has not ever been materialized and diffused, some substantial issues of the system should be pointed out.

First, the image which the present system can deal with is merely made up of about 300 pixels. Even if the size (width) of reversal film is doubled, the number of pixels (optical fibers) is only doubled, while in the digital camera, today’ s usual device relying on the unit of frame, each frame is made up of millions to ten millions pixels beyond comparison—yet the unique visual texture shown in my work owes much to the low resolution.

The system features ‘no frames’ , ‘the analogue system, without frame rate, depending on the section of an optical fiber and the sliding speed of film’ , but might not have any advantage in competition with today’ s high-speed camera.

Here starts my reverie of a fictional history of technologies: In what ways could the system have developed if it had been realized somewhere in the past?

As I made the exhibited model almost manually for myself, the following ideas might not be enough pragmatic to materialize in terms of many issues including workload, precision machining, and difficulty in obtaining parts and materials. As a result, however, my work will shed light on how countless ideas and unfathomable effort of development have realized the system of ‘cinema’ taken today for granted, and how rich and enormous accumulations of thoughts are kept within not only cinema but also any other technologies and expressions.

Below are my experimental notes with the ideas described above.

## Ideas on the improvement of the performance of Bundle Vision

Here 'the receptor/display unit' refers to the image-taking side (functioning as the display side in playback) which introduces light from the object glass to the grid of optical fibers, and 'the exposure/fiber-array unit' to an array of optical fibers set onto the surface of film to serve to record light.

### 1) Improvement of the density of optical fibers (resolution: 2.5 times number of pixels)

Commercially available plastic optical fibers with a diameter of 0.25mm are used in the exhibited model. Industrial glass optical fibers, the diameter of which is 0.10mm for instance, can provide 2.5 times resolution. It is easy to improve the density of fibers on the grid of the receptor/display unit (equivalent to the sensor side of a digital camera) which introduces light from the object glass because the fibers in the exhibited model are a few millimeters apart from each other on the grid, while the most important issue for high density is how to improve the density of the side of the exposure/fiber-array unit in that there is no enough distance between each fiber of the unit set to film. **(Fig. 03)**

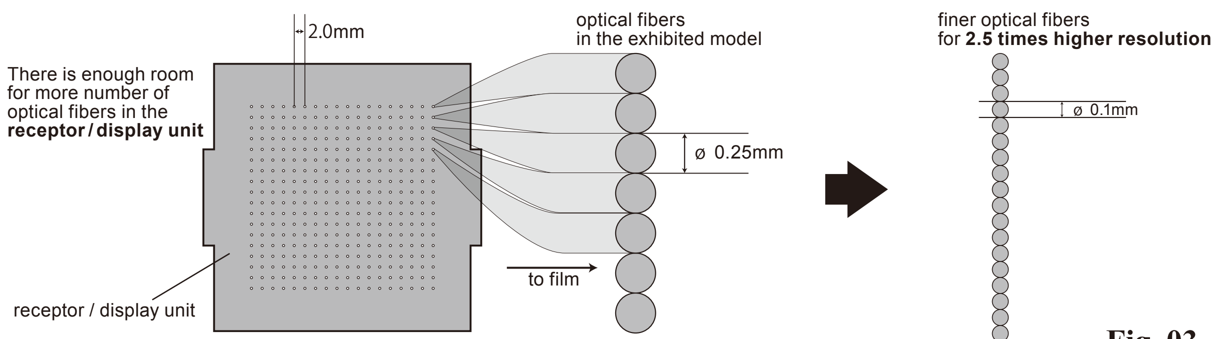


**Fig. 03**

### 2) Enlargement of the film size (resolution: 2.5 times of pixels)

4x5inch sheet film is made to slide in line with its long side in the exhibited model. The mean recording width of the short side is about 90mm, which can hold 360 optical fibers with a diameter of 0.25mm on the side of the exposure/fiber-array unit. Changing the film size and/or the sliding direction can allow to increase the number of optical fibers (which means more pixels).

- Up to about 450 fibers (pixels) when they are arranged in line with the long side of film and then slide in line with its short side. **(Fig. 04a)**
- Up to 900 fibers (pixels), when arranged in line with the long side of 8x10inch film, instead of 4x5inch. **(Fig. 04b)**

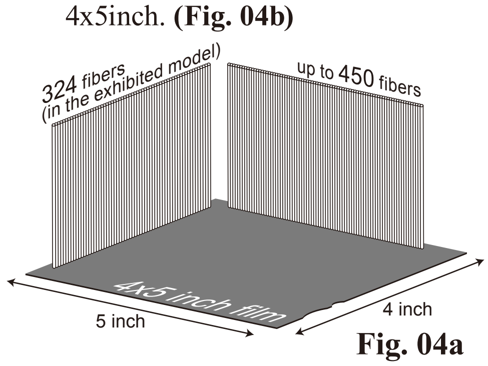


**Fig. 04a**

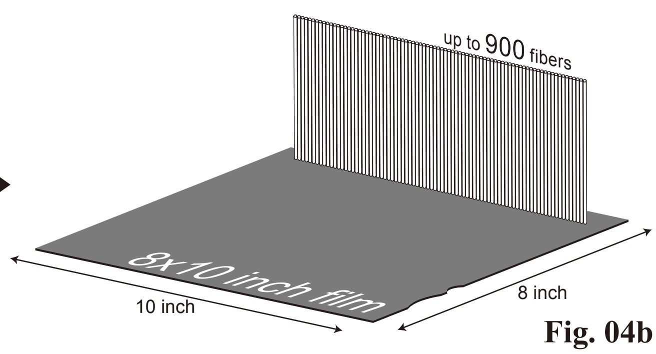


**Fig. 04b**

## 3) Adoption of two or more units of the exposure/fiber array
**(resolution: 2 or more times number of pixels)**

The exposure/fiber-array unit is a set of flexible optical fibers, and therefore it is not necessary to arrange all of them in one single line. If one piece of sheet film is divided into two and then two exposure/fiber-array units are used for shooting (and later playback), the number of pixels can be doubled, although the running time is reduced to half. Furthermore, as the fibers protruding from the receptor/display unit can be divided into as many number of bundles as possible, the number of pixels is also increased as many times as the number of the exposure/fiber-array units with as many pieces of sheet film as that of the unit (however, this will cause the system to get larger). **(Fig. 05)**

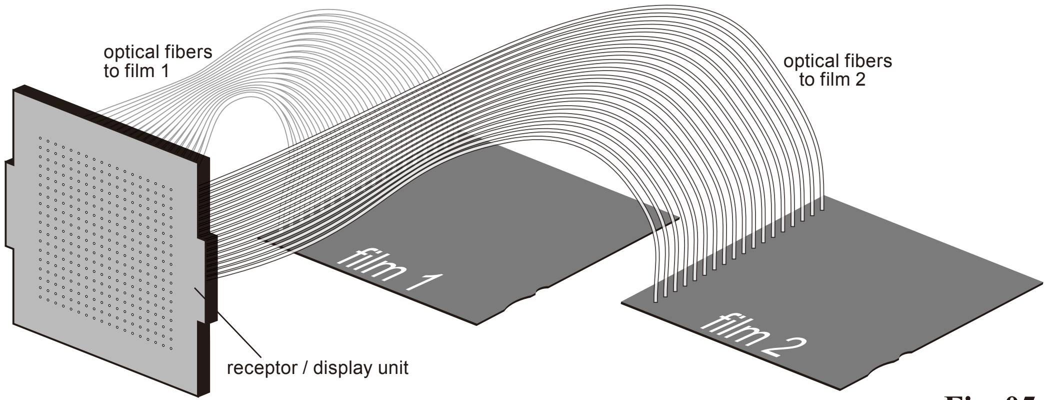


**Fig. 05**

## 4) Color separation of light signals

With a tripled number of fibers of the receptor/display unit grouped into a plurality of sets, each of which is made up of three fibers respectively engaged with R, G, and B filters, film is exposed to light separated into primary three colors in 'layer' . As the photosensitive layers of color film are originally composed of different particles according to the wave length of light, it seems easy to separate light signals recorded onto three layers. It is expected that perceptual resolution is by and large doubled by a tripled number of pixels without the increase of color information. **(Fig. 06)**

This is a technique similar to 'pixel shifting' used in some of 3CCD/CMOS video cameras.

*In addition, I think it possible to record a plurality of pixel information as one single line by means of photosensitive materials which can record polarizing angles, or to divide the band of frequency by means of a dichroic prism, like 3-D cinema employing the dichroic filter.

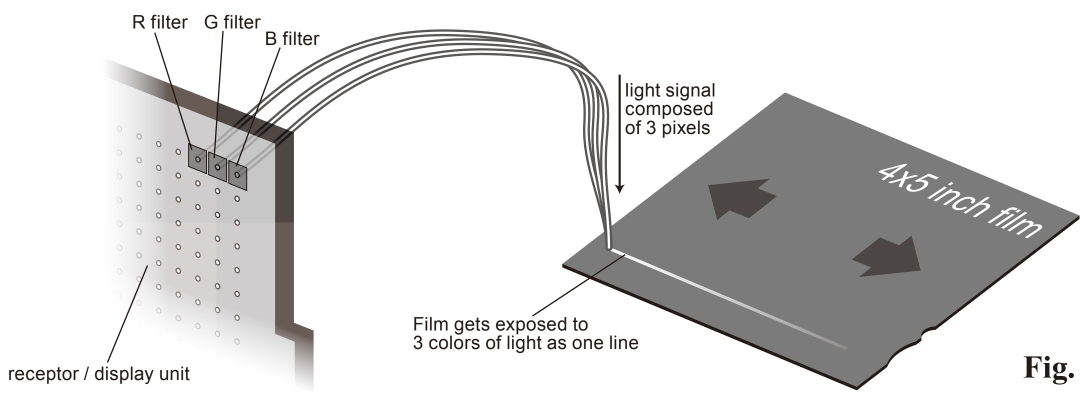


**Fig. 06**

## 5) Minute vibration of the receptor/display unit (improvement of resolution unidentified)

Perceptual resolution is improved using the imprint of each pixel obtained by a minute vibration into which the receptor/display unit is put. For example, if the unit (without rolling) is put into a revolving motion which makes a circle whose radius is about 1mm when the distance between every two pixels is 2mm, light information per pixel is to be recorded/displayed, not as a point but a drawn line. As the revolving pixels leave imprints, it is possible to keep the perceptual continuity of information with an enough short frequency. With this, it is expected that perceptual resolution is improved several tens of times. **(Fig. 07)**
However, the following issues should be noted.

- A precise mechanical or electronic control is needed for vibration which should be accurately interlinked with the supply of film
- This is likely to clash with a basic concept, 'no intermittent motion' , of my work, and as a result, to make such a feature inarticulate (even if each pixel signal is kept continuous).
- A new issue is raised of temporal resolution in accordance with the length of the locus of a circular motion to which all the pixels themselves are put into at the same time. Specifically, film might need to be supplied much faster.

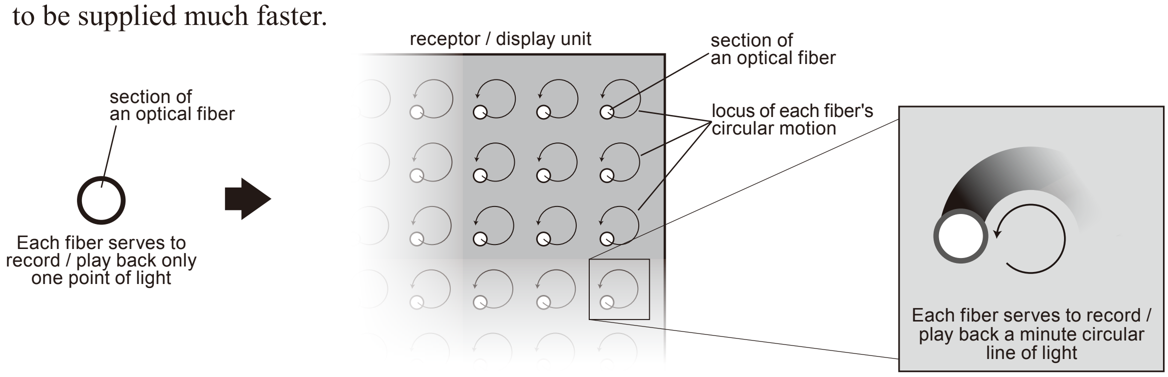


**Fig. 07**

## 6) Mounting of condenser lenses (sensitivity: up to 100 times?)

All optical fibers on the grid of the present receptor/display unit are 2mm apart from each other. This means that most of light is not transmitted to film (approximately 1 to 0.1 per cent of the light which the entire grid surface receives). It is possible to improve dramatically the sensibility of shooting (exposure efficiency), by arranging a conderser lens in front of each fiber, as on-chip microlenses are used for digital cameras. Shooting is difficult with the exhibited model except for outdoors on fine days, but the condenser lens will help to extend the range within which shooting is possible, and to compensate for the decrease of the quantity of light that results from the improvements **(1)-(4)** of the density of optical fibers. **(Fig. 08)**

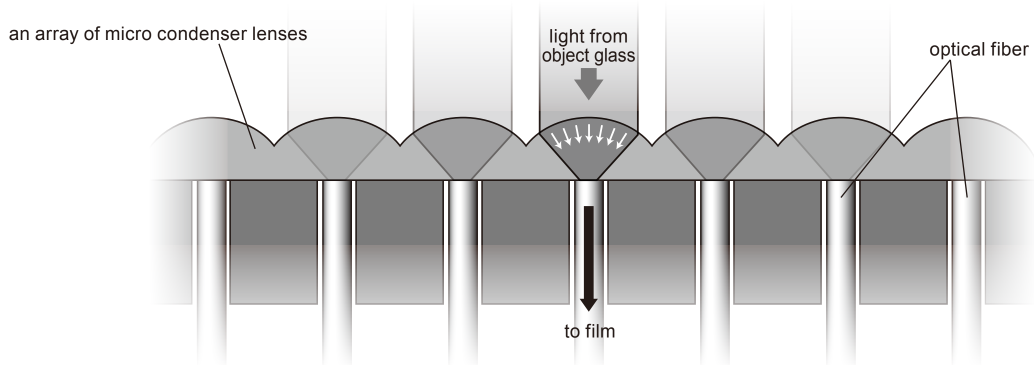


**Fig. 08**

## 7) Enlargement of the receptor/display unit (sensitivity: up to 4 times?)

In the exhibited model is used a **4x4** format (vest pocket size) twin-lens reflex camera to which the size of the receptor/display unit is adjusted. While the mean diameter of the condenser lens in **(6)** is limited by the density of the pixels of the receptor/display unit, and shortened by heightening the resolution in **(1)-(4)**, it is possible to cope with such a situation by enlarging the size of the receptor/display unit itself. For instance, it seems possible to use **6x6** or larger format camera. **(Fig. 09)**

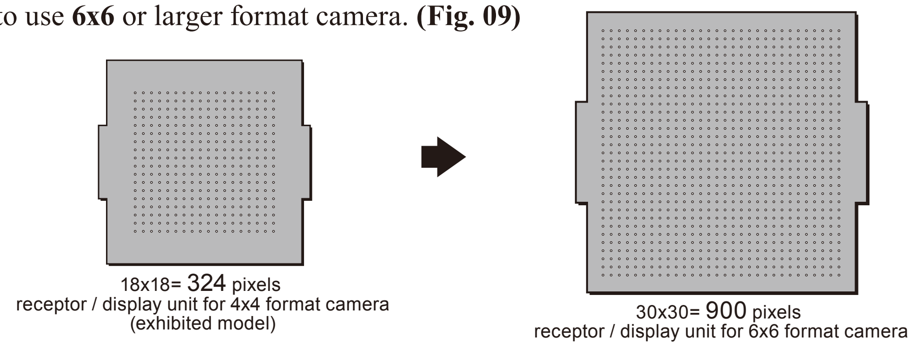


**Fig. 09**

## 8) Possibility of an enlarged projection onto screen

The exhibited model projects moving images onto a small 5x5cm screen. This is due to the following points;

- As the model was all made manually, the precision (for equidistance between fibers) of the exposure/fiber-array unit is low on the one hand; and the light-receiving unit in shooting cannot be different from the display unit in playback on the other.
- A magnifying glass can be used to enlarge the displayed image, but will make it unclear because the original resolution is low.
- The quantity of light is unlikely to be sufficient in playback.

It has been already proved that the exhibited model can project moving images onto screen through the object glass of the camera, when the developed film is lighted from beneath its backside, with the receptor/display unit set to the shooting position (the sensor side behind the camera lens). **(Fig. 10)**

Even when the highest brightness LEDs were used, however, the images enlarged and projected onto screen did not reach as good a level as is required for a general appreciation, because of low resolution and the absolutely insufficient quantity of light.

However, if an increase is made in all the respects of the number of pixels, the quantity of light in playback, and the diameter of lens, it would be possible to obtain a picture quality good enough (as good as early color television?) for home audiences.

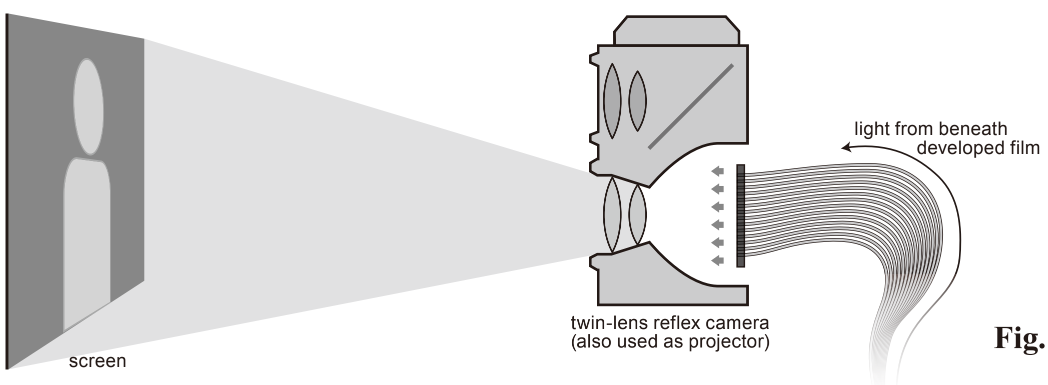


**Fig. 10**

## 9) Other more technologies

In addition, it is possible to envision such technical innovations as in the established media; immediacy by means of instant film, longer recording by means of a large-format roll film, and audio function by means of optical or magnetic soundtrack, portability by means of an efficient design of the components of the system, etc.

## 10) New possibilities of expression

- When a piece of 'ordinary photograph' shot with a conventional 4x5inch camera is loaded in Bundle Vision, spectators can see an 'abstract moving image' created by its different way of decoding.
- You can use a shooting technique like time-lapse photography with an extremely slow supply of film, or shoot with one piece of film for many hours under control of the quantity of light. Unlike a conventional time-lapse photography, slow playback of the resultant film does not lead to frame-by-frame playback; the slower the supply of film, the more inarticulate the change of light on film with respect to time.
- You can create a hand-drawn moving image by drawing manually every streak per pixel on clear film with marking pens or transparent colors **(would this be regarded as any type of animation!?).**