# Hand-rewriting

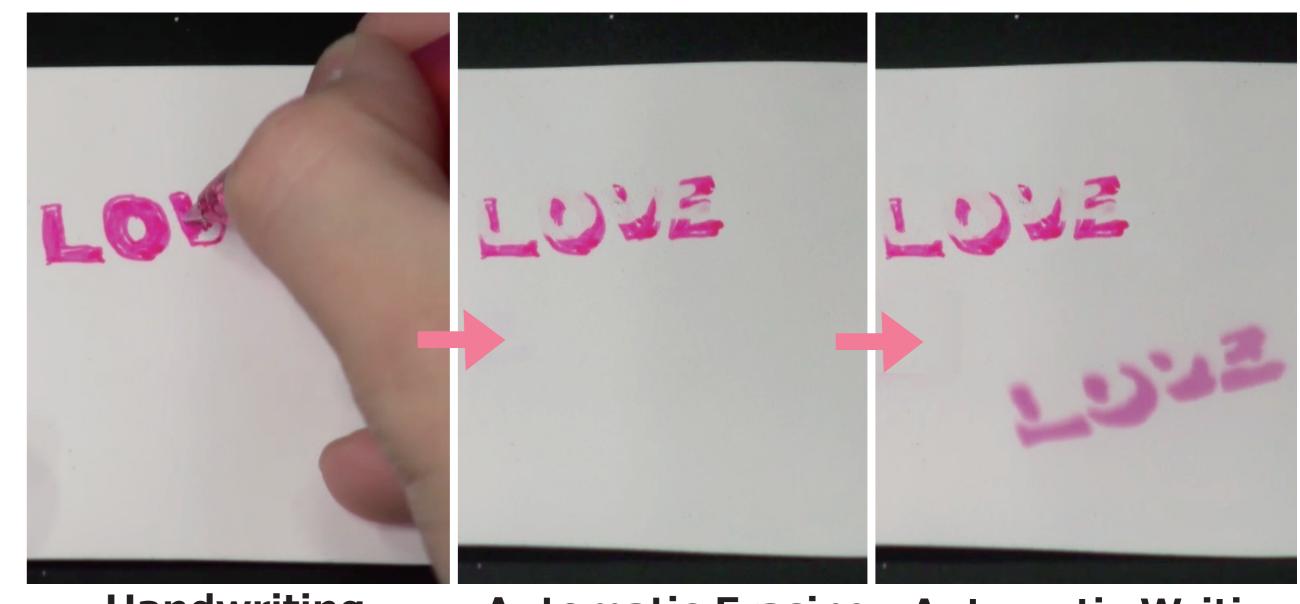


Hybridization of human and computer writing and erasure on paper Tomoko Hashida, Kohei Nishimura and Takeshi Naemura



## Concept

- · Hand-rewriting is a hybrid writing and erasure system in which both users and computer can write and erase freely on the same piece of paper.
- · It is an alternative to combining handwriting and computer control using digital pen and projection system with the following advantages.
  - Hand-rewriting allows for handwritten content in ink to be erased.
  - Ink-based representations on paper both by human and computer combine naturally with each other compared to the combination of paper and projector which would involve selective absorption of uniformly applied light (ink on paper) and selective projection of non-uniform light (projection).



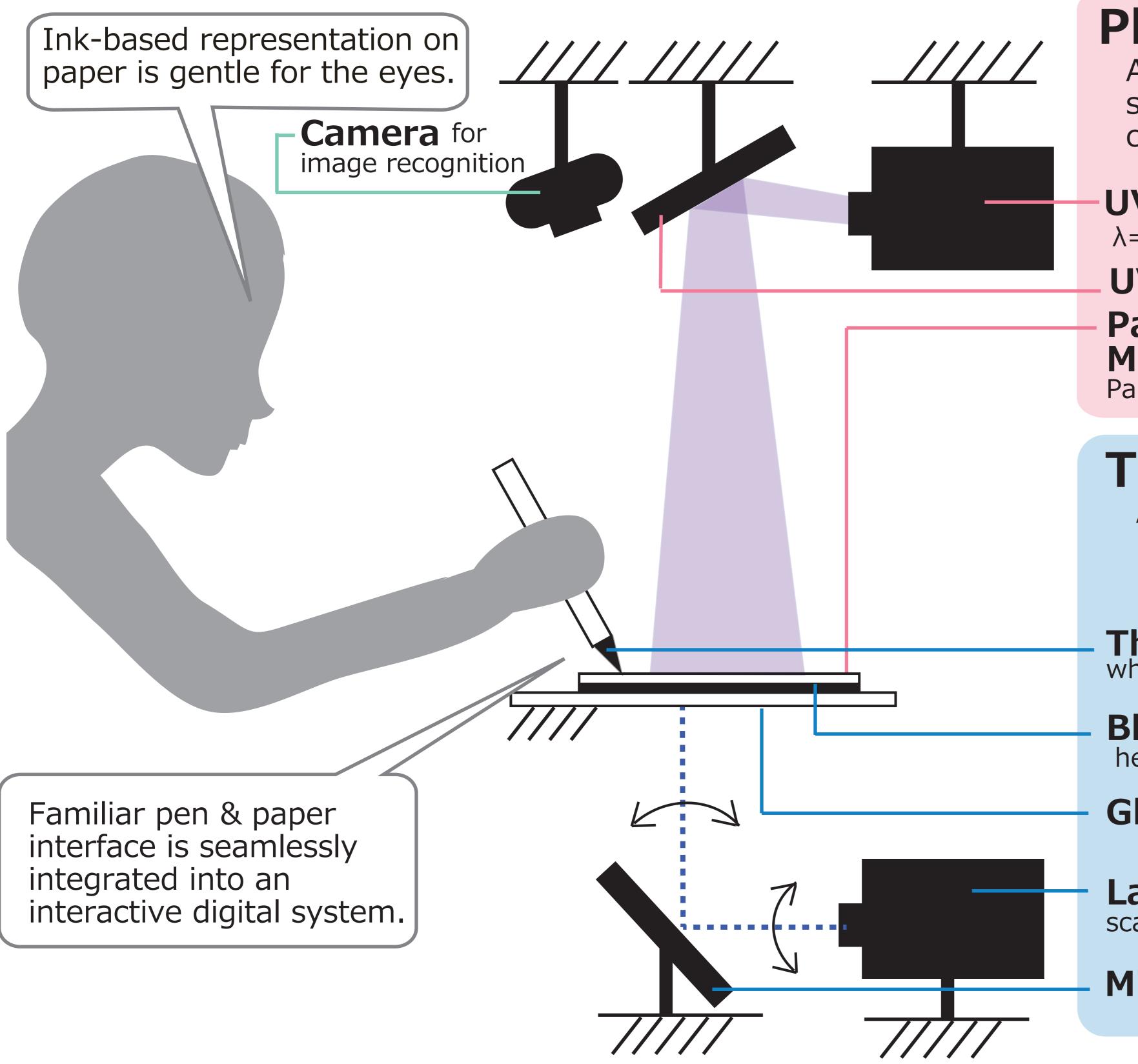


**Automatic Erasing Automatic Writing** 



## System Implementation

Hybrid writing and erasure on paper realized by PhotoScription and ThermoErasure.



#### PhotoScription System

Any pattern may be generated and fixated on paper by selectively projecting UV light on the sheet uniformly coated with photochromic material.

UV Projector used to selectively project UV light.  $\lambda = 365$ nm,  $1024 \times 768$  pixels, DMD driven.

#### **UV** mirror

Paper uniformly coated with Photochromic Material "Spiropyran" shows color when exposed to UV light. Paper is bleach-free to avoid UV fluorescence.

#### ThermoErasure System

Automatically erases specific areas on paper without using an eraser by selectively heating thermochromic ink using laser scanning system.

Thermochromic ink pen, FriXion, uses ink that loses color when heated. Commercially available from Pilot corporation.

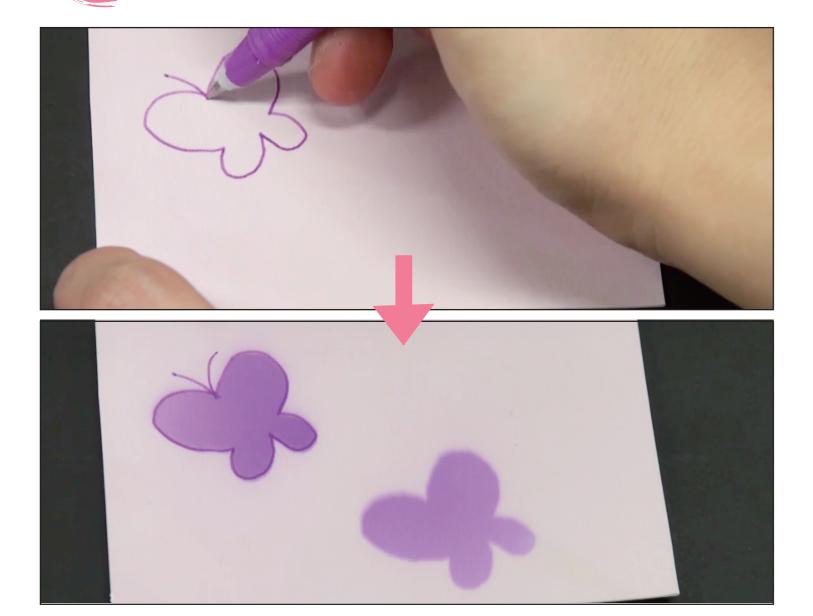
**Black coating** on the back side of the paper enables effective heating of paper by increasing light absorption.

**Glass heater** for pre-heating paper for rapid erasure.

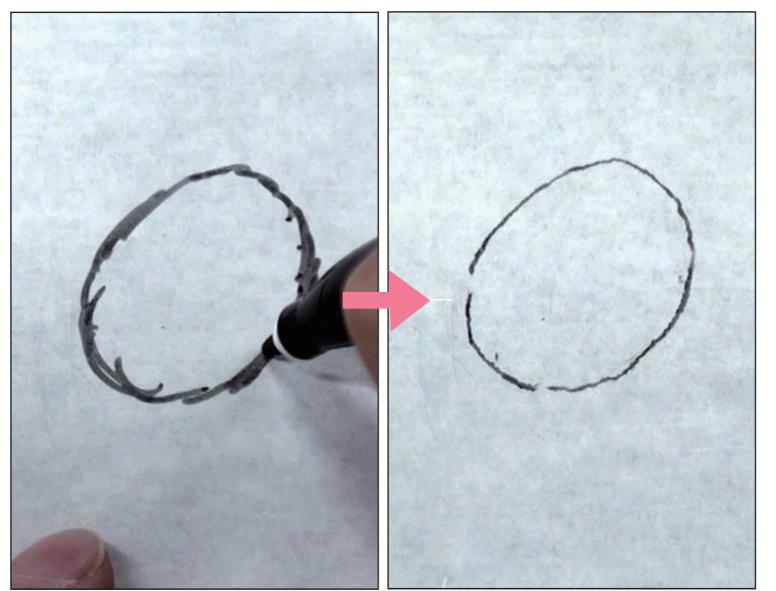
Laser scanning system, consisting of laser and galvanometer scanner, applies light locally to areas to be erased.

Mirror

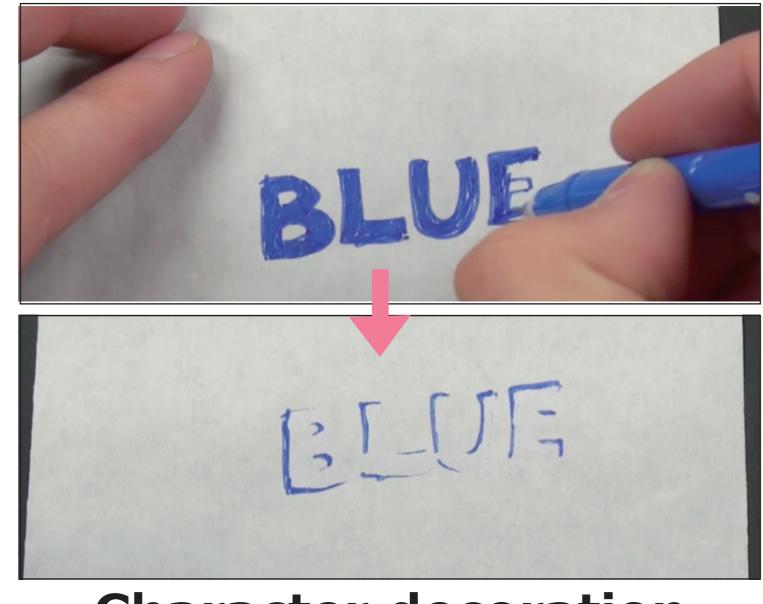
# Application



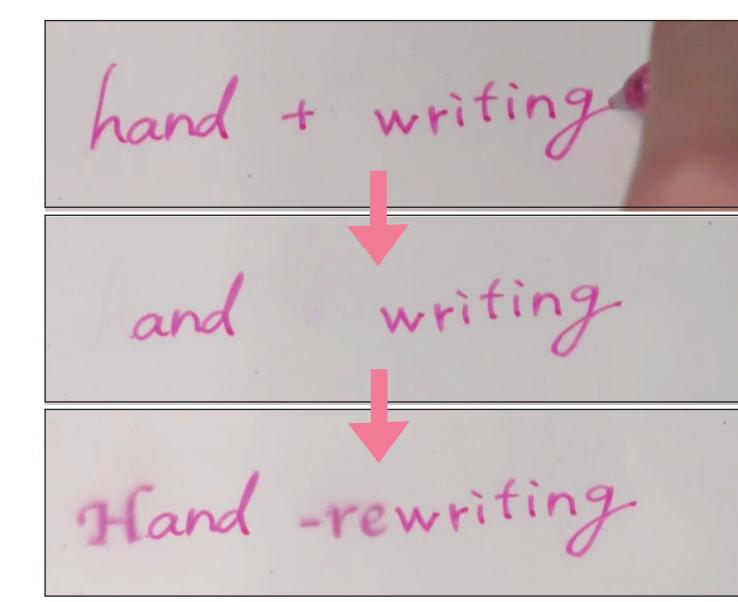
Color filling& duplication



Sketch refinement



Character decoration



**Automatic correction**