

Glowing

--fluorescence installation
with physiological sensors



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Introduction



- ❧ Visualization of bacteria on human skin
- ❧ Fluorescent glowing
- ❧ Glowing color and glowing rate
- ❧ Bacteria database



Outline



- ∞ Key words
- ∞ Technology
- ∞ Device
- ∞ Exhibition
- ∞ Experience

Key words



- ∞ Synthetic gene oscillator
- ∞ Wearable wireless physiological sensor
- ∞ Fluorescence highlighting installation

Technology

∞ Synthetic gene oscillator:

A cell, such as a bacteria, oscillates in certain rate. A fast and tunable oscillator was created in 2008.

The oscillator consists of a circuit which can activate the fluorescent protein inside the cell. This fluorescent protein can activate the circuits in its surroundings. As a result, millions bacteria will glow together in certain rate.

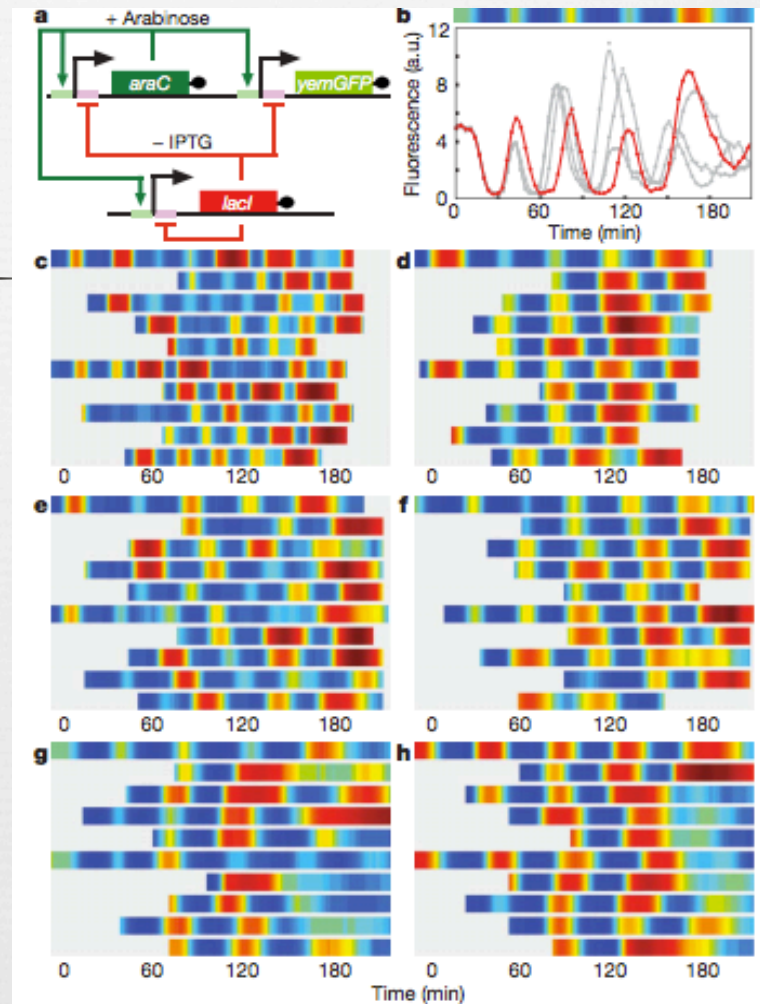
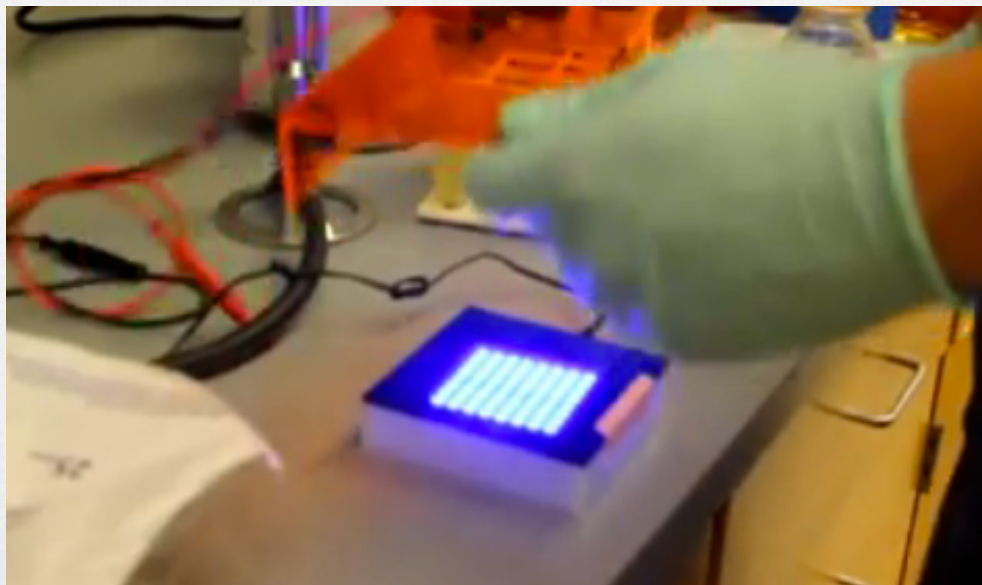
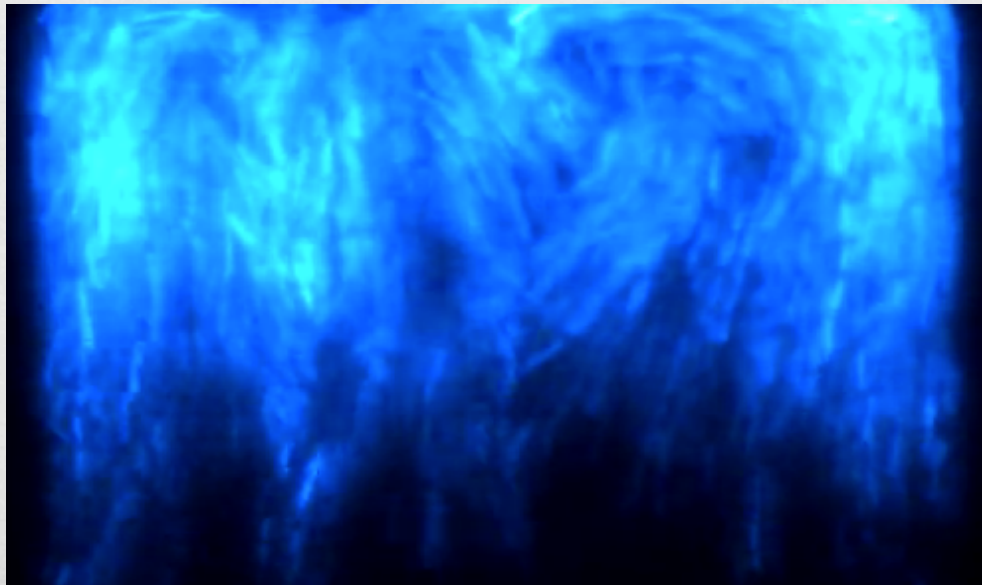


Figure 1 | Oscillations in the dual-feedback circuit. **a**, Network diagram of the dual-feedback oscillator. A hybrid promoter $P_{lac/ara-1}$ drives transcription of *araC* and *lacI*, forming positive and negative feedback loops. **b**, Single-cell fluorescence trajectories induced with 0.7% arabinose and 2 mM IPTG. Points represent experimental fluorescence values, and solid curves are smoothed by a Savitsky–Golay filter (for unsmoothed trajectories, see Supplementary Fig. 3). The trajectory in red corresponds to the density map above the graph. Density maps for trajectories in grey are shown in **g**, a.u., arbitrary units. **c–h**, Single-cell density map trajectories for various IPTG conditions (**c**, 0 mM IPTG; **d**, 0.25 mM; **e**, 0.5 mM; **f**, 1 mM; **g**, 2 mM; **h**, 5 mM).



Sample of E.Coli Bacteria

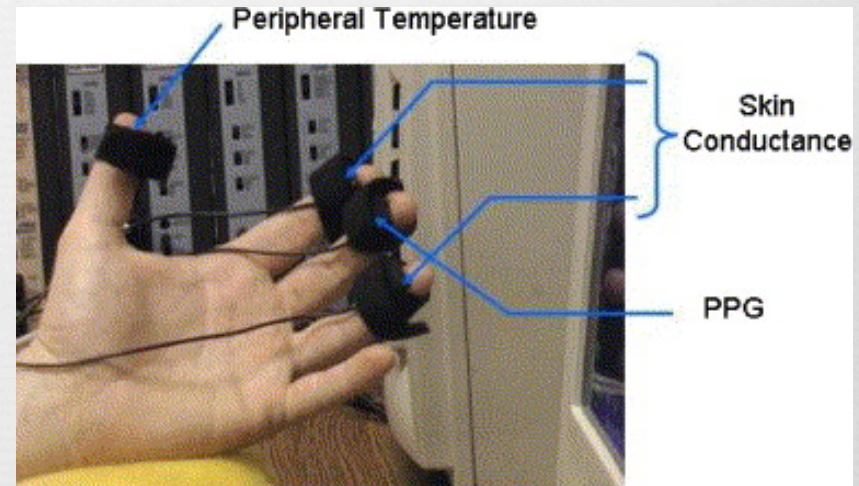


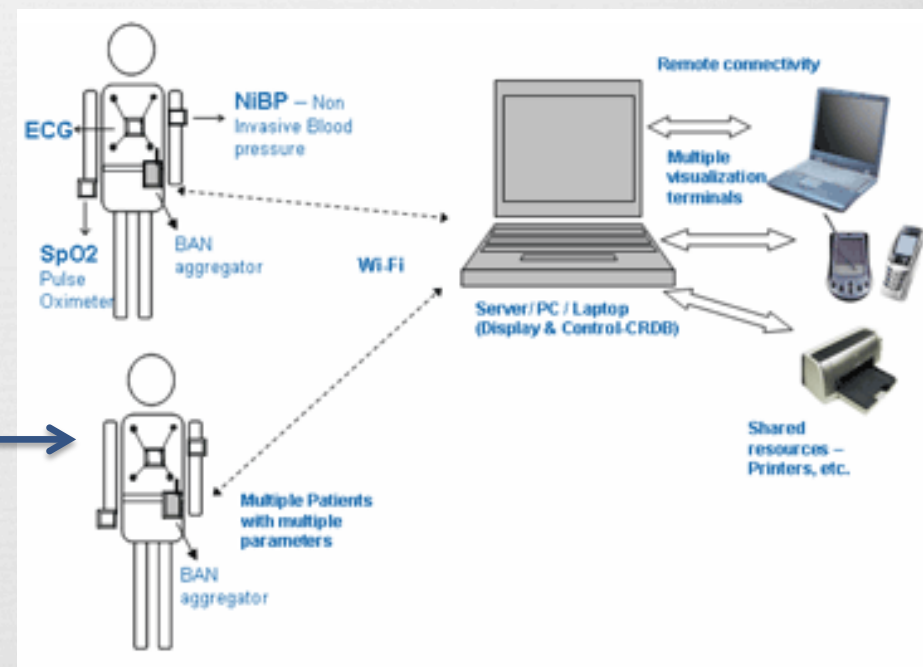
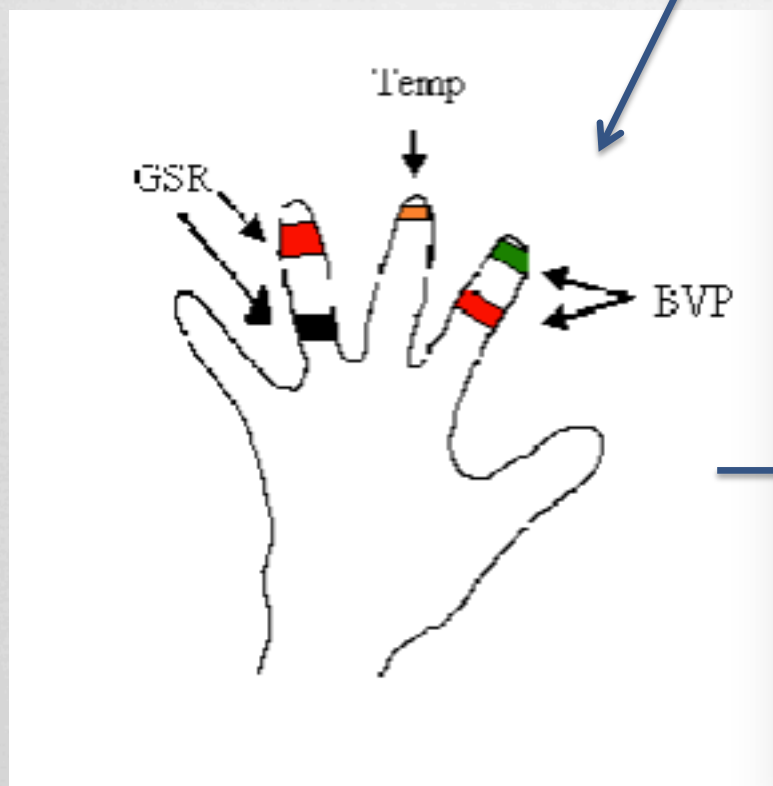
Technology



Wearable wireless physiological sensor

The device can read the skin temperature, conductance and blood oxygen level of the individual wearing the device. It can then connect directly to a computer, where it outputs the results of the data gathered from the subject.

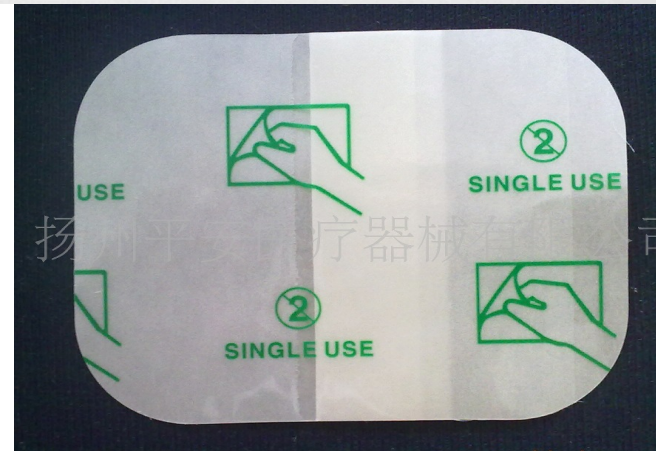




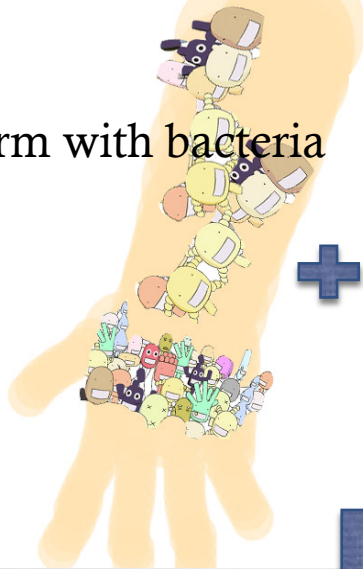
Device



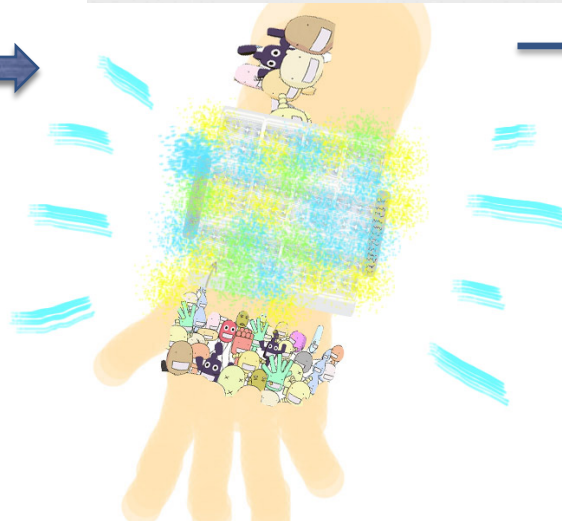
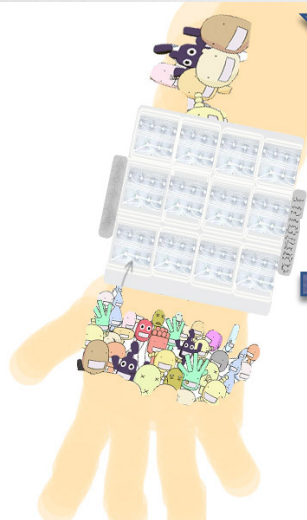
- ❧ A transparent device consists of circuits. Accelerate the generation of the fluorescent protein inside the bacteria.
- ❧ The physiological sensors on the device can adjust the skin temperature of the viewers. The glowing rate and luminance will be controlled.
- ❧ The wireless device could be stuck to people's arms and legs.

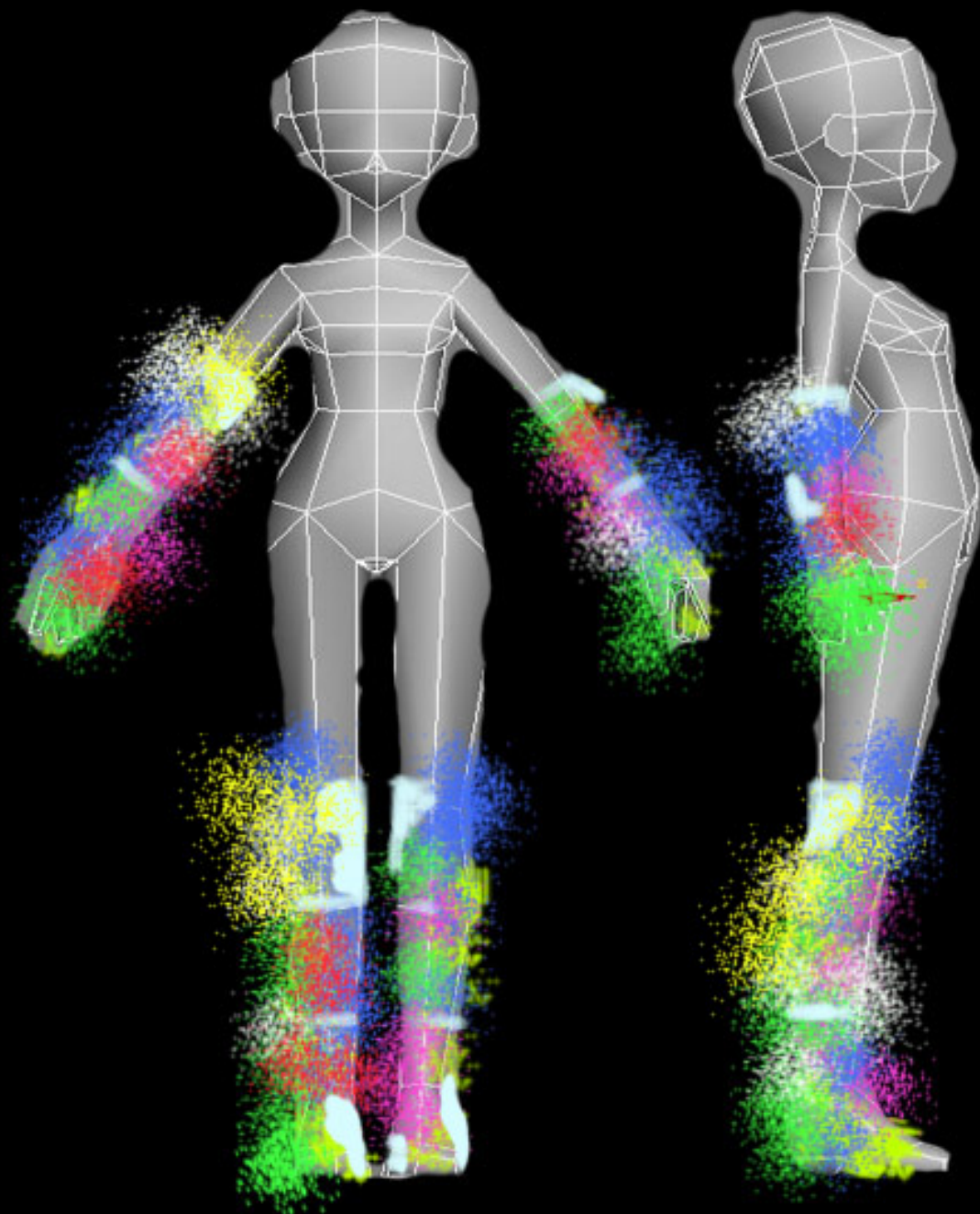


Arm with bacteria



Transparent Circuits
with physiological sensors

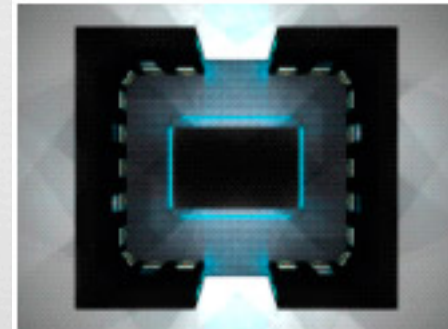




Exhibition



∞ Project will be presented in science museum.



In the dimmed exhibition space there will be five large, round screens.



Experience

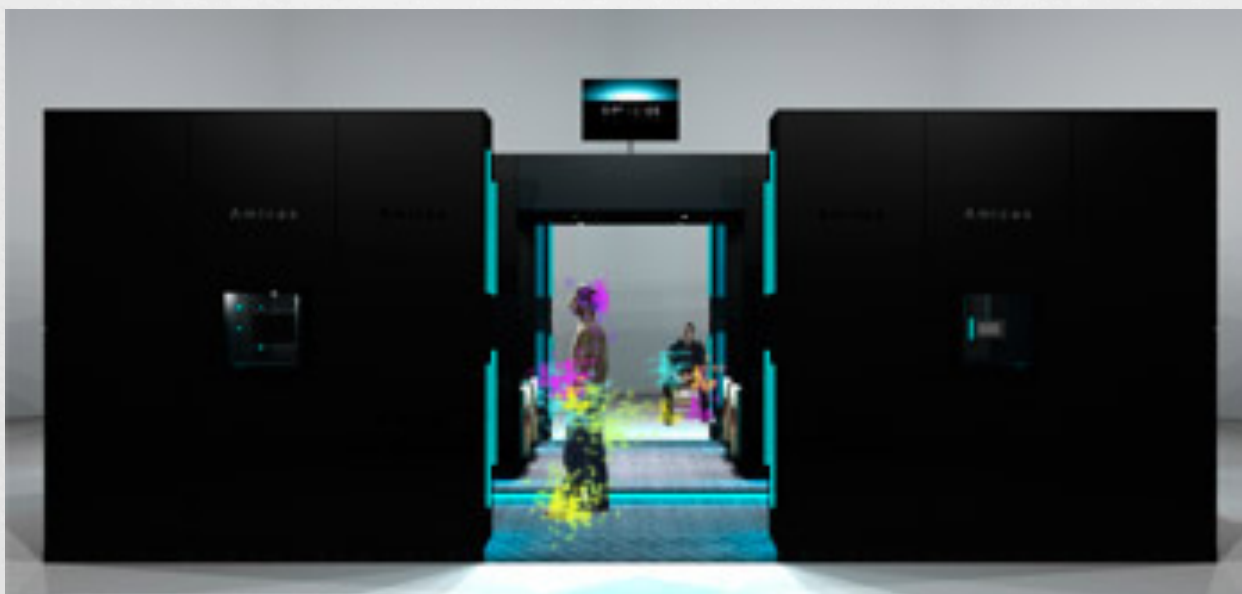


- ❧ The image of viewers will be projected on the left side of the screen.
- ❧ When touch the glowing area, information about certain bacteria will be shown on the right side.
- ❧ When press the buttons controlling the skin temperature , viewers can observe the changes of glowing rate and luminance.



Vibrio

Vibrio is a genus of Gram-negative bacteria possessing a curved rod shape, several species of which can cause food borne infection, usually associated with eating undercooked seafood.



Sources:



- ❧ <http://biodynamics.ucsd.edu/pubs/articles/Stricker08.pdf>
- ❧ http://courses.cs.tamu.edu/rgutier/cpsc483_s04/reports/wearable-final.pdf
- ❧ <http://vimeo.com/37189163>
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