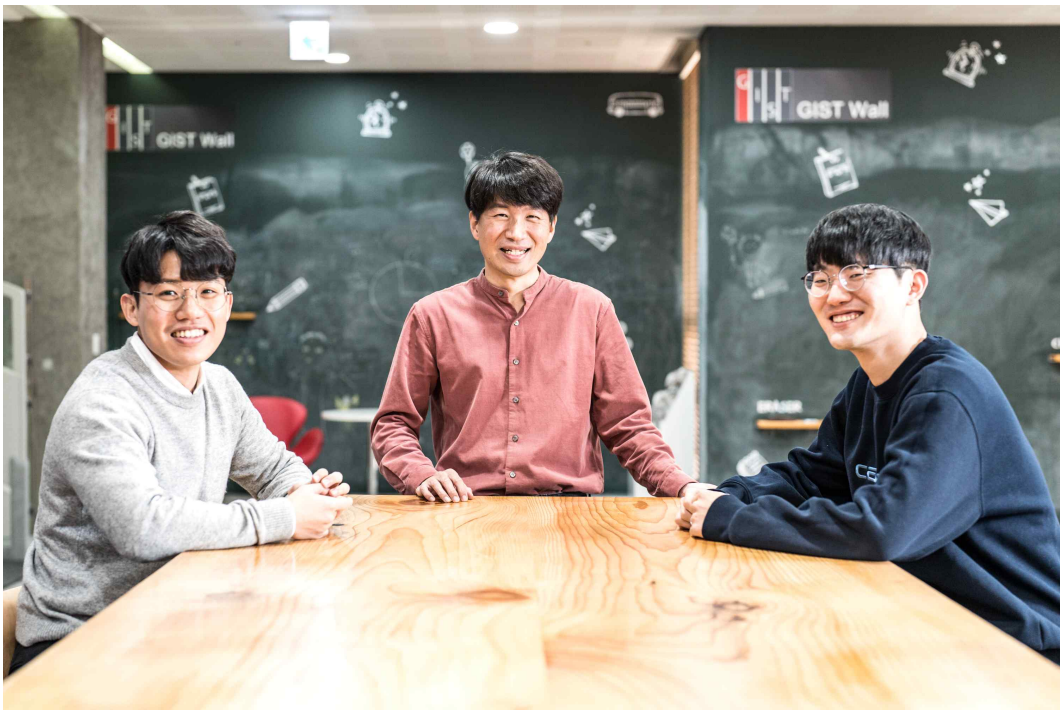
Small physical security clue... development of a small optical PUF device

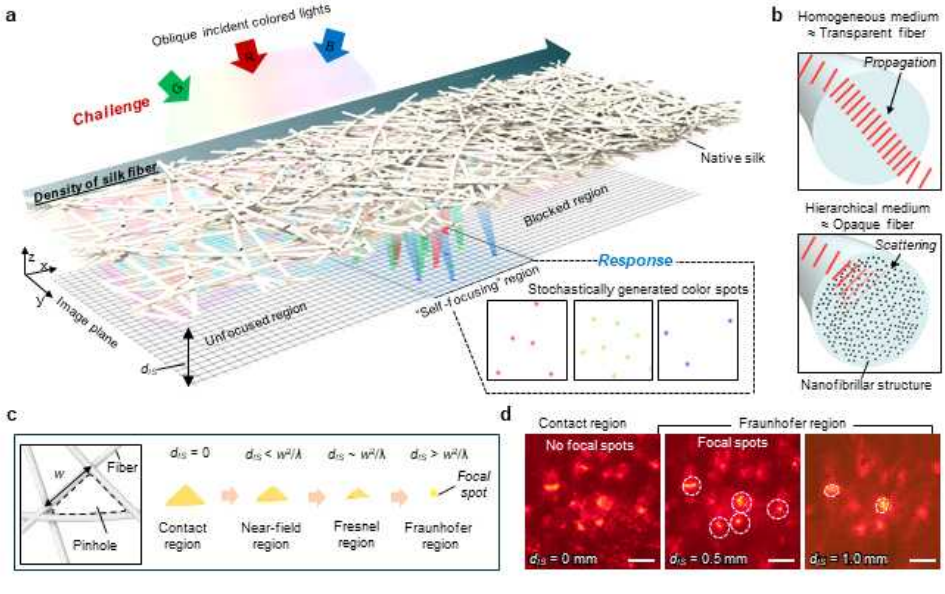
— Physical security key generation through hierarchical nano structure... physical security expectation through optical phenomenon



▲ From left: Researecher Gil Ju Lee, Professor Young Min Song, and Researcher Min Seok Kim

In the era of the Internet of Things, a clue was found in nature to create a physical security key that can prevent information leakage.

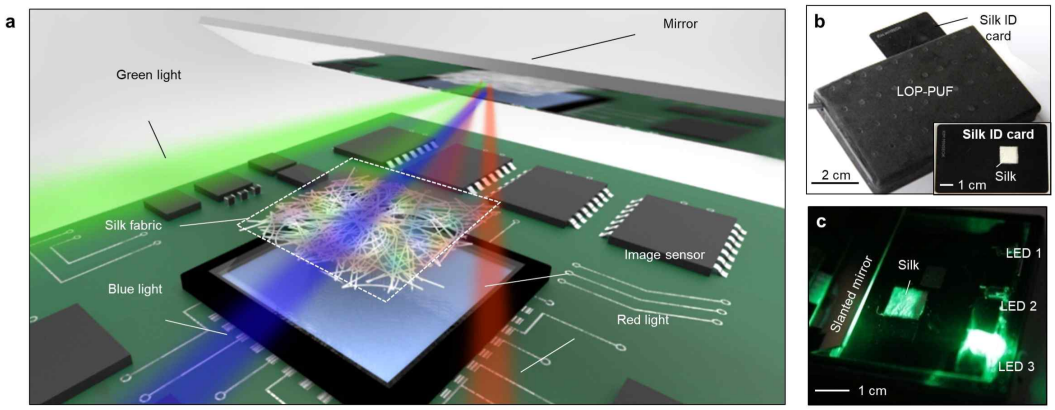
GIST (Gwangju Institute of Science and Technology, President Kiseon Kim) School of Electrical Engineering and Computer Science Professor Young-min Song's research team developed a method to generate a physical security key using the micro-nano-scale hierarchical structure present in silk extracted from cocoons.



▲ Diffraction of light through silk fiber media and properties of silk

Security key technology, commonly referred to as a Physically Unclonable Function (PUF)*, was previously manufactured using a complex semiconductor process. The PUF produced in this study does not require a separate manufacturing process because it uses silk itself that exists in nature.

* Physically Unclonable Function (PUF): Technology that allows devices manufactured through the same process method to generate completely different security keys. Manufactured using the difference in microstructure of the normal semiconductor process.



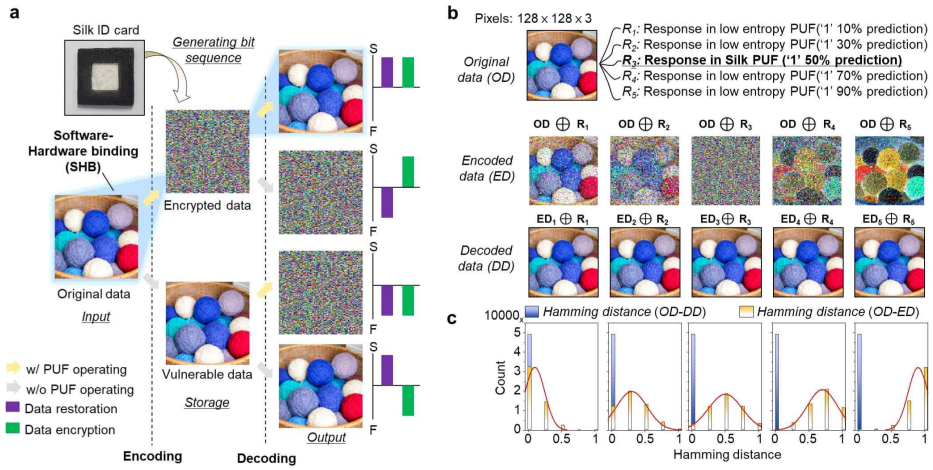
▲ Devices and modules that cannot be physically reproduced using silk

The silk-based physical security key developed by the research team is not only an authentication device for maintaining strong security of Internet of Things devices and end users but is also expected to be a clue for applications such as generation of encryption keys for data transmission and storage.

When LED light is irradiated on the surface of natural silk, the light is diffracted due to the nano- and micro-scale hierarchical structures that are randomly distributed inside the silk, and the light is strongly concentrated at random locations. If an image sensor absorbs it and converts it into an electrical signal, a security key consisting of 1s and 0s can be generated.

The encryption key generated through silk has passed the randomness test provided by the National Institute of Standards and Technology (NIST), and it was confirmed that high reproducibility and randomness were exhibited.

Meanwhile, this study was conducted using silk, a random fiber medium that exists in nature, or electrospinning. Alternatively, it is expected that a device that cannot be physically replicated can be developed that is strong against humidity and temperature by manufacturing a random fiber medium using 3D printing technology.



▲ An example of using a device that cannot be physically replicated using silk

Professor Young Min Song said, "This is the first case that revealed that natural silk also has a unique encryption key like human fingerprints. It uses materials as they are in nature without complicated processes."

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