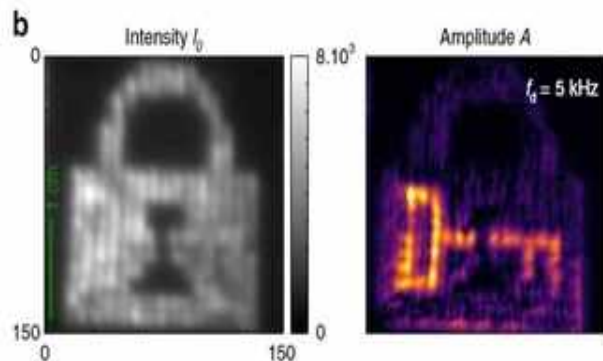


Novel tech to decrypt data optically has potential uses ranging from surveillance to food quality analysis

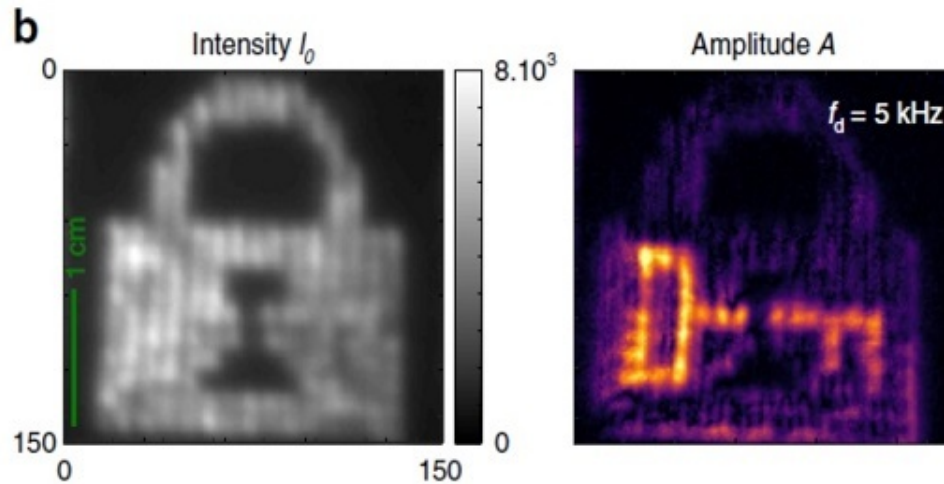
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Using FAST-QUAD, the picture on the left was transmitted, which has encrypted in it the picture of a key and is not normally visible. Upon demodulation at the correct frequency, the image of the key is retrieved.

BENGALURU: After more than two decades of work, researchers at Raman Research Institute (RRI) here, along with collaborators from University of Rennes, France, have developed and demonstrated a new technique of decrypting encrypted information — generally done electronically — through optical technology.

They claim that the technology has the potential for encrypting and decrypting images, surveillance, navigation under poor visibility, optically imaging through tissues and underwater vision. Besides, the technique is likely to open up possibilities for 3D ranging and imaging, optical communications, food quality analysis, and specialized scientific instrumentation.



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In many fields information is encrypted or modulated by the sender and is retrieved by the receiver by the process of “demodulation”, which is extraction of the original information-bearing signal from a carrier wave.

And, demodulation is done electronically, which in the case of images, has to be done pixel by pixel. This requires time, which for most purposes, may be small enough to be ignored. However, for certain applications, like aircraft navigation, even the tiny amount of time taken for demodulation makes the technique unsuitable for practical use.

Prof Hema Ramachandran, along with a team of scientists at the Light and Matter Physics group at RRI and collaborators, has provided a means of demodulation optically rather than electronically. For this, experiments were carried out in the real fog, both in France and in India.

“This speeds up the process significantly, and full demodulated images are obtained instantaneously upon recording a single

frame using an ordinary digital camera. The technology is called FAST-QUAD (Full-field All-optical Single-shot Technique for Quadrature Demodulation),” the Department of Science and Technology, which funds RRI, said in a statement.

The technique has two components – the concept and the device. A prototype has been built and demonstrated. The team’s work has been published in Nature Communications, and two related international patents have been filed which are in the final stages of processing.

The techniques currently being used for the demodulation of optical signals at radio frequencies and higher face numerous practical challenges like the need for phase synchronization, timing jitters, inability to perform snapshot operation, and difficulty in frequency tuning.

This technology developed by Prof Hema bypasses these challenges by performing the demodulation optically, making use of the polarization of light. This technique is compatible with high-frequency operation up to the radio frequency range.

The entire process of demodulation (multiplication and integration) is performed optically, and over the entire field of view, eliminating the need for pixel-by-pixel demodulation. This offers an enormous speedup and provides a demodulated image with a single snapshot of the camera.