भारतीय सांकेतिक विज्ञान संस्थ हैदराबाद्
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

Press Release

Muscope, world smallest Microscope developed by IIT Hyderabad

Scaled down to a few mm, this microscope will make medical devices low cost, mobile and automated.

Highlights:

- *Measures only a few mm on a side*
- *Made only of off-the-shelf electronic chips*
- *Fully software controlled and automated*
- *Can image wide area with high resolution, e.g., blood smear samples*
- *Multiple Muscope can be embedded in a small area*
- *Various imaging modalities*

Hyderabad: June 29, 2021: Downscaling of electronic circuits started a revolution that is still unfolding. It made chips do more while costing less and consuming less power. Microfluidics has promised to do the same for the analysis of small objects like cells flowing in small channels. Muscope, the smallest Microscope developed to date, was conceived in the laboratory of Dr. Shishir Kumar to look at the cells in microfluidic chips without using the bulky desktop microscopes. The desktop microscopes are also costly, manual, and fragile, all of which are a no-no for small devices. In contrast, Muscope uses only a few off-the-shelf electronic chips, namely an image sensor and a microLED display, making it ideal for automated assembly and operation.

The Muscope can be scaled down further from its already tiny form to harness the benefits of deep integration, enhanced mobility, lower cost, and robustness. Resource-constrained or specialized medical devices, extreme conditions of environmental monitoring, agriculture, and animal husbandry are some domains where Muscope can excel. *The researchers are keen on commercializing the technology, expanding the work to disease detection using biomarkers, miniature analysis systems, and machine learning-aided workflows.*

Congratulating Dr. Shishir Kumar for this noteworthy work, Prof. B. S. Murty, Director, IITH, said, "IIT Hyderabad is committed to bringing the benefits of technology to the society. This new invention will positively impact many areas, especially, healthcare and life sciences research. Looking forward to its early and wider adoption."

There exist several palmtop-sized mini-microscopes, and very few are smaller. A common thread in these designs is the removal of the lens train and the use of computational imaging to cover up for the limited resolution. To aid the improvement in resolution, usually, a light source like a laser is used, which is not easy to minimize and operate. A contributing factor to this meager downscaling is perhaps also the lack of attention given to the importance of integration into larger systems. The team of researchers led by Dr. Shishir Kumar includes PhD scholar Ms. Ekta Prajapati and MTech candidate Saurav Kumar, used a micro-LED display to remove the bulk associated with the light source and at the same time to provide capabilities for computational imaging. The display consists of micron-sized LED emitters arranged on a rectangular array. The micro-LEDs can be individually switched on, and they are very bright. These unique features of the micro-LEDs allow good quality imaging in restricted space.

The illuminating light coming from a microLED can also be moved around in a two-dimensional plane, just by selecting a different microLED from the array. This movement can be used for capturing images of samples under slightly different lighting conditions. Such images can be fused to increase the resolution. The movement of light sources also makes it possible to capture images of widely separated regions of the sample, effectively increasing the field of view (FOV).

Ekta Prajapati, who did most of the experimental work, is excited about embedding Muscope in the microfluidic chips she has been developing. *"Muscope will greatly simplify and automate our system. Environmental control can be local to the parts of the chips, multiple locations can be observed without any movement of the chips, and everything can be scripted. This will be a game-changer for many such instruments."*, she added.

Hear from researchers, how the Muscope being developed and function: *https://youtu.be/qTs3ogOG_zE*

Researchers can be reached via our public relations at pro@iith.ac.in for any further query in the subject matter.

###

About IIT Hyderabad

Indian Institute of Technology Hyderabad (IITH) is one of the six new IITs established by the Government of India in 2008. In a short span of **12** years, the institute has become **top-10** in the **NIRF** and **QS** with **241** full-time faculty and **3,397** students (**20**% women). The institute has a strong research focus with more than Rs **435** crore of sanctioned research funding with PhD scholars accounting for about **30**% of total student strength. IITH has to its credit **5500+** research publications, **166** patent disclosures, **1440** sponsored/consultancy projects, **200** state-of-the-art laboratories, **5** research and entrepreneurship centres, and **50** industry and academic collaborations.

To know more, please visit https://www.iith.ac.in/.

Follow us on Twitter - https://twitter.com/IITHyderabad
Follow us on Facebook - https://www.facebook.com/iithyderabad/
Follow us on Instagram - https://www.instagram.com/iithyderabad/
Follow us on LinkedIn - https://www.linkedin.com/school/indian-inst-of-technology-yderabad/mycompany/

Please direct all media queries to:
Mrs. Mitalee Agrawal | Public Relations Officer, IIT Hyderabad
Cell: 8331036099 / Email: pro@iith.ac.in

You can view all press releases/ notes from IIT Hyderabad at https://pcr.iith.ac.in/pressrelease.html.