Single molecule-guided Bayesian localization super-resolution microscopy for live cell imaging

Fa Zhang[1], Mingshu Zhang[2], Pingyong Xu[2]

1. **Key Lab of Intelligent Information Processing, Institute of Computing Technology, Chinese Academy of Sciences, Beijing 100190, China.**
2. **Key Laboratory of RNA Biology, Institute of Biophysics, Chinese Academy of Sciences, Beijing, 100101, China**

E-mail: pyxu@ibp.ac.cn

Practical live-cell super-resolution (SR) techniques are long-desired in many routine biological labs to image biomolecule dynamics. However, the current methods either require sophisticated optical setups and deep experts or have difficulties to achieve high spatial and temporal resolutions simultaneously. Here we present a powerful single molecule guided Bayesian localization microscopy (SIMBA), which uses simple off-the-shelf total internal reflection fluorescence (TIRF) equipment to produce an appropriate 50 nm SR image of actin in fixed cells, and calculates a series of whole-cell live structures with a 0.5-2 s temporal resolution for 50 time points on a desktop computer. The reconstruction results show reliable structures with practical resolution comparable with PALM results in fixed cells. Live-cell SIMBA also reveals that clathrin coated pits (CCPs) are highly dynamic structures involving assembling and disassembling of individual ring-like pits by interacting with each other (Fig 1). With good compatibility to TIRFM, PALM/STORM and light-sheet microscopy equipped in many labs, SIMBA should be useful in a wide variety of live-cell SR imaging applications.

.