We present the application of the Point Spread Function (PSF) deconvolution method to the astronomical Integral Field Unit (IFU) Spectroscopy data focus on the restoration of the galaxy kinematics. We apply the Lucy-Richardson deconvolution algorithm to the 2D image at each wavelength slice. We make a set of mock IFU data which resemble the IFU observation to the model galaxies with a diverse combination of surface brightness profile, S/N, line-of-sight geometry and Line-Of-Sight Velocity Distribution (LOSVD). Using the mock IFU data, we demonstrate that the algorithm can effectively recover the stellar kinematics of the galaxy. We also show that lambda_R_e, the proxy of the spin parameter can be correctly measured from the deconvolved IFU data. Implementation of the algorithm to the actual SDSS-IV MaNGA IFU survey data exhibits the noticeable difference on the 2D LOSVD, geometry, lambda_R_e. The algorithm can be applied to any other regular-grid IFS data to extract the PSF-deconvolved spatial information.

특별세션 EHT

[구 EHT-01] Event Horizon Telescope : Earth-sized mm-VLBI array to image supermassive black holes

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Immediate vicinity of a supermassive black hole (SMBH) is an important place to test general relativity in strong gravity regime. Also, this is a place where mass accretion and jet formation actively occurs at the centers of active galaxies. Theoretical studies predict presence of bright ring-like emission encircling an accreting SMBH with a diameter of about 5 Schwarzschild radii, and a flux depression at the center (i.e., BH shadow). Direct imaging of the BH shadow is accordingly of great importance in modern astrophysics. However, the angular sizes of the horizon-scale structures are desperately small (e.g., ~40-50 microarcseconds (uas) diameter for the nearest best candidates). This poses serious challenges to observe them directly.

Event Horizon Telescope (EHT) is a global network of sensitive radio telescopes operating at 230 GHz (1.3 mm), providing ultra-high angular resolution of 20 uas by cutting-edge very long baseline interferometry techniques. With this resolution, EHT aims to directly image the nearest SMBHs; M87 and the galactic center Sgr A* (~40-50 uas diameters). In Spring 2017, the EHT collaboration conducted a global campaign of EHT and multiwavelength observations of M87 and Sgr A*, with addition of the phased ALMA to the 1.3mm VLBI array. In this talk, I review results from past mm-VLBI and EHT observations, provide updates on the results from the 2017 campaign, and future perspectives.

[구 EHT-02] EHT data processing and BH shadow imaging techniques

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Event Horizon Telescope (EHT) aims to resolve the innermost region to the super massive black hole (SMBH) with its extremely high angular resolution (~20-25 uas) and enhanced sensitivity (down to 1-10 mJy) in concert with the Atacama Large Millimeter/submillimeter Array (ALMA) at 1.3 mm wavelength. This has a great importance as the first observational probe of the black hole shadow which has been theoretically predicted as a ring-like emission affected by the general relativistic effect under a strong gravitational field of SMBH.

During the 2017 April 5-11, four nights of EHT observing campaign were carried out towards its primary targets, M87 and SgrA*. To robustly ensure the data processing, independent pipelines for various radio data calibration softwares (e.g., AIPS, HOPS, CASA) have been developed and cross-compared each other. The EHT has also been developing newer interferometric imaging techniques (e.g., eht-imaging-library, SMILI, dynamical imaging), as well as using an established method (CLEAN). With these, the EHT has designed various strategies which will be adopted for convincing imaging results.

In this talk, I review how the robustness of EHT data processing and imaging will be validated so that the results can be ensured against well known uncertainties or biases in the interferometric data calibration and imaging.

[구 EHT-03] Korean activities for mm-VLBI and EHT collaboration

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