Toward next generation large optical telescope for Korean astronomy - I. precision CNC grinding and metrology

Sug-Whan Kim[1,2], Ho-Soon Yang[3], Geon-Hee Kim[4], Jeong-Yeol Han[1,2], Ju-Hwan Kim[4], Hyung-Gon Kim[5]

[1]*Space Optics Laboratory, Depart. of Astronomy and Space Science, Yonsei University*
[2]*Center for Space Astrophysics, Yonsei University*
[3]*SaTReC initiative Co.Ltd. 18F Sahak Bldg., Taejon*
[4]*Korea Basic Science Institute*
[5]*Seoul Optical Ind. Co., Ltd, Office 68-1, Byong Am-Ri, Saeng Guek-Myon, Eumsung-Goon, Choongbook*

The construction of a new large optical telescope, ranging from 4m to 8m in aperture, is gaining an increased level of attention in and around Korean astronomical society. Regardless the size of telescope aperture, prior development of relevant technology at part, sub-system and system levels are essential precursors to the successful completion of such telescope construction. We report an active machining approach for high precision CNC grinding for large optical surfaces of up to 2 m in work-piece size. This new approach is concerned with 1) parametric machining intelligence incorporating the novel 'floating' trajectory management. 2) optimum machining regime for surface form and texture in nanometer scale and 3) efficient form assessment capability. The technical details and the experiments undertaken are presented. The results imply that the new machining regime can increases the production throughput greatly by removing the loose abrasive lapping and the initial polishing from the traditional fabrication process. This new machining approach may form an efficient and cost-effective solution to the challenging throughput requirement for the fabrication phase if the segmented mirror design was to be adapted for the telescope optics.