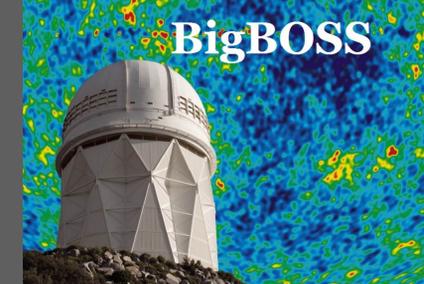


The CCD camera testing instrument for the BigBOSS fiber positioner



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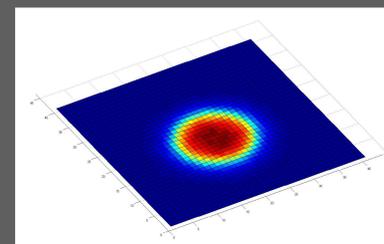
Throughput of a fiber-robot-based multi-object spectrograph depends on the accuracy and precision of the fiber position system. An efficient and accurate method of quantifying the performance of an actuator is necessary during the design iteration process, final design, and for post-production characterization. A CCD camera-based optical setup was developed at the Lawrence Berkeley National Laboratory to test these parameters of fiber robot positioners. The setup is described, as well as tests used to quantify distortion and cross-check measurement accuracy.

Abstract

Introduction

During BigBOSS R- θ actuator prototype design process, there are many different types of flexure need to be tested. The image on the left is shown several levers and flexures which are used in the test.

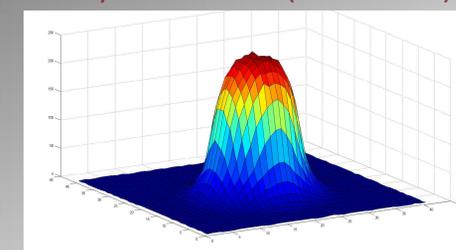
Spot size = 18 X 18 pixels



Test image

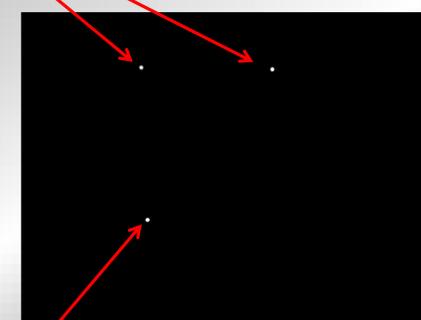
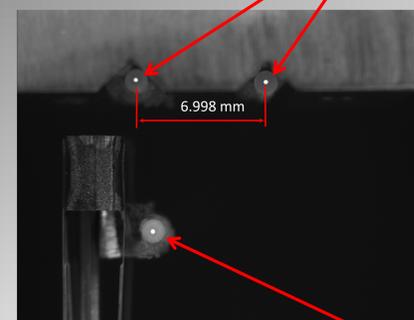
Fiber spot sharp read out on the CCD sensor, deal with MATLAB

Gray Scale = 248 (Max = 255)



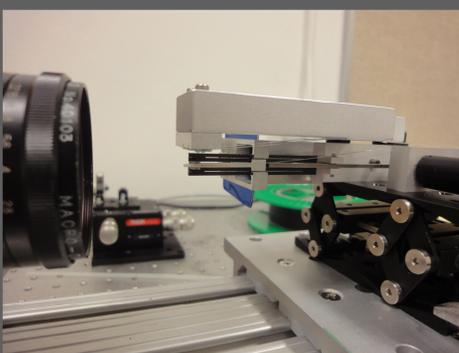
After the calibration the camera system, there are two reference fibers used in the test. The distance between the two fiber is made by v-groove and the distance is measured by smart scope which is 6.998mm.

Two reference fibers



Tested fiber

System Setup

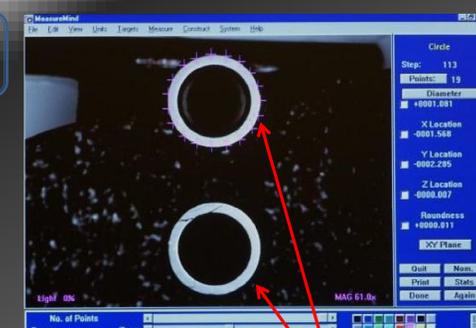


A CCD camera - based test system is shown on the two above images. The CCD camera capture the image from the back-illuminated fibers to acquire the position of the flexure expansion.

Comparable test setup

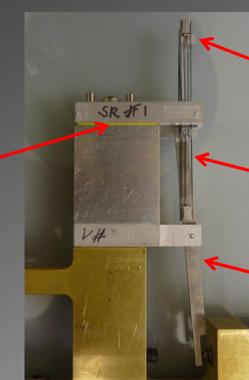


Smart Scope lens



Two fiducials on the top end of flexure

Shim to adjust different touch point position

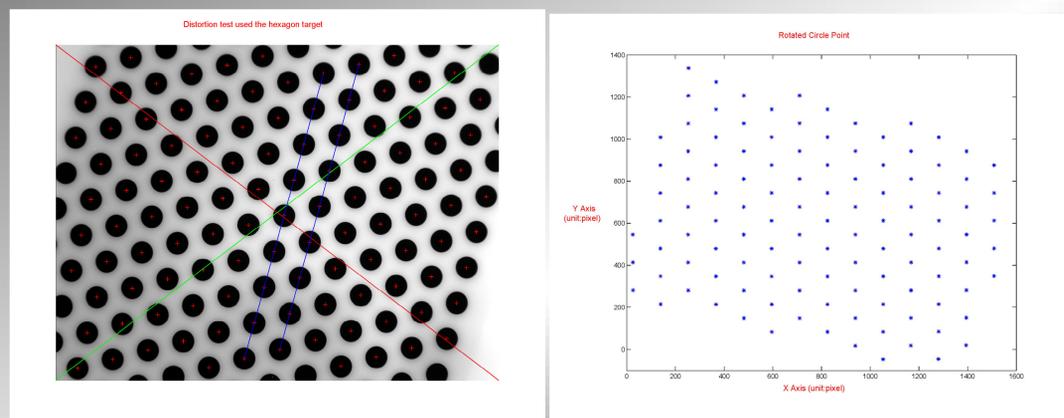


Fiducials position

Flexure

Lever

Camera System Calibration



Standard target with hexagon spots is used for calculating the camera systems' parameters. The red cross points are the center of spots acquired by the MATLAB.