

IMPLEMENTATION OF A LINE-SCAN CAMERA TRIANGULATION SENSOR FOR A BALL BALANCER

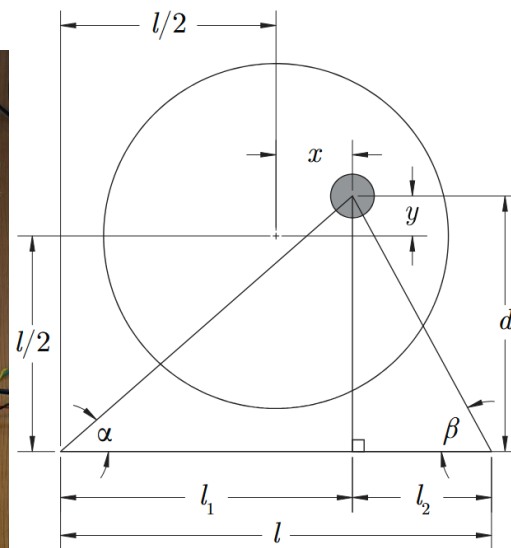
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California Polytechnic State University, San Luis Obispo

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Ball Balancer or Ball on Plate systems are used for education and research in control theory. These consist of a plate which can be actively tilted, with a ball rolling on the surface. Students are challenged to model the dynamics of the system and implement a control loop which is capable of stabilizing the ball by actuating the plate. The mechatronics group at Cal Poly is developing hardware for one of these ball-balancer systems, for future use in the Mechanical Engineering curriculum. The position of the ball relative to the plate must be measured in order to control and stabilize it. To more fully characterize the system, the velocity of the ball should also be measured or estimated, as well as the angular position and velocity of the plate. For our purposes, this data should be of reliable quality for direct input into the controllers developed by students. In previous iterations of the design, the motion information for the ball came from a resistive touch panel. However, the quality of data which resulted from this limited the performance of the system as a whole. This thesis implements an alternative system for detecting the position and velocity of the ball. Using two line-scan cameras, the ball is located by triangulation without direct contact.