ABSTRACT

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Stabilized cameras are used in several applications, such as in Unmanned Aerial Vehicles(UAV) and mobile robots, in order to keep the image fixed at a certain point, even in the presence of host vehicle motion. For this and control strategies are employed in order to maintain this stabilization. In this work, an extension of the Binary Model-Reference Adaptive Control (BMRAC) is presented for uncertain multivariable systems with arbitrary and non-uniform relative degrees, using output feedback. BMRAC presents itself as a robust adaptive alternative with good transient performance, multivariable structure suitable for working with mechanical imbalances and advantages for uncertain systems. It makes use of a recently proposed differentiator with dynamic gains based on Higher-Order Sliding Modes (HOSM). Likewise, a second strategy is presented which consists of applying a multivariable version of Unit Vector Control (UVC) also employing the HOSM based dynamic gains differentiator. Simulations will be presented for both two and three degrees of freedom gimbals, the first with data obtained from a vehicle on uneven terrain and the second from data acquired from a UAV in autonomous flight.

Keywords: Higher-Order Sliding Modes; Multivariable Adaptive Control; Unit Vector Control; Gimbal.