

**ADAPTIVE VISION ATTENTIVE ROBOT
EYE FOR SERVICE ROBOTS
IN DOMESTIC ENVIRONMENTS**

Master of Science Dissertation

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FOR SERVICE ROBOTS
IN DOMESTIC ENVIRONMENTS**

A dissertation submitted to the
Department of Electrical Engineering, University of Moratuwa
in partial fulfilment of the requirements for the
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by

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May 2017

DECLARATION

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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ABSTRACT

Using eyes as an input modality for different control environments is a great area of interest for enhancing the bandwidth of human machine interaction and providing interaction functions when the use of hands is not possible. Interface design requirements in such implementations are quite different from conventional application areas. Both command-execution and feedback observation tasks may be performed by human eyes simultaneously. In order to control the motion of a mobile robot by operator gaze interaction, gaze contingent regions in the operator interface are used to execute robot movement commands, with different screen areas controlling specific directions. I have developed of adaptive vision attentive robot eye for a service robot.

In this project a methodical approach has been followed to the design and develop an interactive robotic eye for adapting robot attention to user command request about the distance of an object based on the visual attention of the robot. In a human robot interaction, the humans may use command request, which focus or search object a feedback whether the movement is “near”, “middle”, and “far”. The actual quantitative meaning of those terms depends on spatial arrangement of the domestic environment where the attention is focused on. Therefore, spatial information of the environment is analyzed to adapt robot’s perception about the distance of an object, which is in its vision field. The process includes the mechanical and electrical designs, in the design process close attention has been paid to the human bio-mechanics to realize a design that reaches anthropomorphism to a closer degree.

The proposed method is capable to mimics key visual functions of the human brain promises to robot eye maneuver quickly and safely through adaptive vision field through the domestic environments. The motion of changing adaptive vision field which used a focus or search objects in domestic environment more human-like manner using depth map analysis. Also the proposed robotic eye is designed in such a way that it can be used as a platform for facilitating further developments in integrating more interactive features to robotic eye.

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ABBREVIATIONS

ASIMO	Advanced Step in Innovative Mobility
GPS	Global Positioning System
ARM	Adaptive Resolution Method
DOF	Degree of Freedom
EOM	Extraocular Muscles
CAD	Computer Aided Design
CMOS	Complementary Metal Oxide Semiconductor
DC	Direct Current
PC	Personal Computer
IC	Integrated Circuit
PWM	Pulse Width Modulation
USB	Universal Serial Bus
OpenCV	Open source Computer Vision
CAMShift	Continuously Adaptive Mean Shift
HSV	Hue Saturation Value
ROI	Region of Interest