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(71)**Name of Applicant :**
1)Gowri Shankar Manivannan
Address of Applicant :Associate Professor Department of Electrical and Electronics Engineering Malnad College of Engineering ---------- ----------
2)Mr. RANJAN N A
3)Mr. DEEKSHITH V
4)Mr. SUDEEP C K
5)Mr. KRUPAL T
Name of Applicant : NA
Address of Applicant : NA
(72)**Name of Inventor :**
1)Gowri Shankar Manivannan
Address of Applicant :Associate Professor Department of Electrical and Electronics Engineering Malnad College of Engineering ---------- ----------
2)Mr. RANJAN N A
Address of Applicant :Associate Professor, Department of EEE, Malnad College of Engineering, Hassan Hassan ---------- ----------
3)Mr. DEEKSHITH V
Address of Applicant :UG Student, Department of EEE, Malnad College of Engineering, Hassan Hassan ---------- ----------
4)Mr. SUDEEP C K
Address of Applicant :UG Student, Department of EEE, Malnad College of Engineering, Hassan Hassan ---------- ----------
5)Mr. KRUPAL T
Address of Applicant :UG Student, Department of EEE, Malnad College of Engineering, Hassan Hassan ---------- ----------

(57) Abstract :
This invention introduces an AI-based boom barrier control system designed to enhance vehicular access management and safety in controlled environments such as parking lots, toll plazas, and restricted areas. Leveraging a hybrid approach combining DeepLabV3+ for semantic segmentation and EfficientNet for object classification, the system processes real-time video feeds to accurately detect and identify vehicles and obstacles. The architecture integrates advanced image processing and AI algorithms to perform precise vehicle classification and obstacle detection, enabling intelligent decision-making for barrier control. The system dynamically adjusts the barrier's operation based on real-time data, ensuring smooth and secure access while preventing accidents caused by unexpected obstacles. Key features include high-resolution image processing, accurate segmentation of vehicles and surrounding objects, and adaptive control mechanisms to handle diverse environmental conditions. Evaluation metrics such as accuracy, precision, recall, and F1-Score demonstrate the system's high efficiency and reliability. This innovative solution offers a seamless, automated approach to traffic management and access control, enhancing operational efficiency and safety in various applications.

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