

**Department of Electronics and Communication Engineering**

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| **Title of the Project:** | **HYBRID METAHEURISTIC APPROACH FOR NON-LINE-OF-SIGHT VEHICLE LOCALIZATION TO ENHANCE EMERGENCY MESSAGE PROPAGATION IN VEHICULAR AD-HOC NETWORKS** | | |
| **S.No** | **Students Name** | **Register Number** | **Year / Sem / Sec** |
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| **Flow Diagram** | | | |
| **System Integration**   * Command Center Integration * Cloud Data Center Integration   **Localization & Message Handling**   * NLOS Node Localization * Emergency Message Propagation   **Hybrid Processing**   * Ant Colony Optimization (ACO) * Simulated Annealing (SA)   **Data Acquisition & NLOS Detection**   * Input Data Collection * NLOS Detection and Classification | | | |
| **ABSTRACT** | | | |
| Non-Line-of-Sight (NLOS) vehicle localization remains a critical challenge in Vehicular Ad Hoc Networks (VANETs), affecting accurate node positioning and timely emergency message delivery. Traditional methods often underperform in urban settings due to dynamic obstacles, high mobility, and signal interference, resulting in increased delays and lower packet delivery rates. This research introduces a hybrid metaheuristic approach that combines Ant Colony Optimization (ACO) and Simulated Annealing (SA) to improve NLOS localization. ACO excels at exploring optimal node positions but can converge too quickly on suboptimal solutions. SA addresses this by applying probabilistic adjustments that refine these solutions and enhance global optimization. The proposed ACO-SA hybrid improves localization accuracy, reduces communication delays, and increases packet delivery rates, ensuring more reliable data exchange in urban environments. Simulation results demonstrate that this method outperforms standalone ACO, SA, and traditional approaches in terms of scalability, efficiency, and accuracy. By optimizing node placement and routing, this work contributes to the development of smarter, more responsive VANET systems for smart cities. | | | |
| **APPLICATIONS** | | | |
| * Emergency Response Systems * Smart Traffic Management * Collision Avoidance Systems * Autonomous Vehicle Navigation | | | |
| **PROJECT 2025** | | | |