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# Smart Tree Planting Robot Using Bluetooth

**Abhishek R. Pansare[1], Ashwini S. Lamkhade[2], Pranali K. Hingade[3], Ashwini T. Athave[4], Mrs. K.S. Tarwade[5]**
Department of Electronics and Telecommunication Engineering, [12345]
Adsul's Technical Campus, Chas

**Abstract:** *Afforestation has emerged as a critical strategy to combat climate change, restore degraded ecosystems, and increase global carbon sequestration. Traditional methods of tree planting are often labor-intensive, inconsistent, and unsuitable for large-scale operations. To overcome these challenges, this study presents the design and development of a Smart Tree Planting Robot that automates the sapling plantation process using embedded systems and wireless communication. The proposed system features an Arduino Uno microcontroller (ATmega328P), an L293D motor driver, SG90 servo motors for precise planting actions, and four 100 RPM DC gear motors for stable locomotion. Bluetooth-based control is achieved through the HC-05 module, enabling real-time operation via an Android mobile interface.*

*The power system consists of two 3.7V 2000mAh Li-ion batteries managed by an 8.4V 20A Battery Management System (BMS), ensuring safe and efficient field deployment. The robot performs critical tasks such as soil digging, sapling placement, and coverage, significantly reducing manual labor and ensuring consistent planting depth and spacing. A custom-designed PCB reduces wiring complexity and improves reliability, supporting modular integration and future upgrades.*

*This project draws on developments in autonomous and semi-autonomous tree-planting robotics, as demonstrated by previous research on systems such as Treebot for climbing and planting in constrained environments [1], photovoltaic-powered planting machines [2], and 3D vision-based nursery transplant robots [3]. Comparable advancements in fully automatic machines capable of high-speed planting [4], and intelligent structural designs for terrain adaptability [5], informed the mechanical and electronic design strategies in this study.*

*Experimental testing across different terrain types confirmed the system's stability, scalability, and operational efficiency. The robot presents a cost-effective, portable, and user-friendly solution for afforestation, sustainable agriculture, and remote reforestation efforts.*

**Keywords:** Smart Tree Planting Robot; Arduino Uno; Afforestation; Bluetooth Control; SG90 Servo; ATmega328P; L293D Motor Driver; Environmental Robotics; Automation in Agriculture; Reforestation Technology



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