

# 中文摘要

皮帶式無段變速器(CVT)以其速度變化平穩、操作簡便、維護容易等特性，而被大量使用做為速克達機車的傳動系統。傳統式的 CVT 系統在低速或低扭力時有傳動效率低的問題，且離心滾子及斜板滑動片用久會有磨耗的現象；為改善此問題，本論文旨在設計一套電子控制式無段變速系統(ECVT)，藉由各種感知器取得引擎轉速、車速、節氣門開度等訊號，配合機車引擎動力輸出性能，計算出即時的最佳速比，預期可依不同的引擎特性或行駛道路環境，規劃出不同的速比變化曲線，使得引擎能夠保持在較高性能輸出或較低油耗區運轉，如此可減少動力傳遞時的損失，提升能源效益；ECVT 主要為利用電子設備控制變速，擺脫傳統 CVT 機構上的限制，並自動補償離心滾子、斜板滑動片…等磨耗的影響，其優點主要在提升整車的效率與耐用度，且能避免因離心滾子磨耗所造成的變速誤差。本研究為求方便設計控制器，利用電腦軟體 MATLAB/Simulink 建構出機車的動態模型，使用暨有的引擎扭力與油耗數據搭配 ECVT 與傳動系統的動態數學模式，以縮短開發時程與成本。

## 英文摘要

The advantages of smoother speed ratio change, simple operating and easy to repair, etc., are the main reasons for the rubber V-belt Continuously Variable Transmission (CVT) being popular used in scooters. The weaknesses of the traditional CVT system are the low transmission efficiency at the lower speed or lower torque, the centrifugal rollers and movable flange have the worn-out problems which may reduce the materials life-cycle. In order to solve these problems, the aim of this study is to design a brand new Electronically-controlled Continuously Variable Transmission (ECVT) system, which integrated the engine's rotating speed, the vehicle speed and the Throttle Position Sensor (TPS). By applying the motorcycle engine performance charts, the optimum speed ratio can be calculated and used for different types of engines as well as different driving conditions; therefore, a better performance and lower fuel consumption can be expected. The newly designed ECVT use an electronic control equipment to change the speed ratio which can overcomes the limitation of the traditional CVT mechanism, and automatically compensate the worn-out effects of the centrifugal rollers and movable flange. Also, the ECVT may provide higher efficiency, durability, reliability, and accurate movement for the transmission system.

A set of motorcycle dynamic models was built first in this research for simulation and controller design, use and there has been of engine torque data match the ECVT transmission systems dynamic mathematical model, shorten to develop the timing and costs.