# CONSTRUCTION AND TESTING OF A BATTERY DRIVEN VARIABLE-RELUCTANCE DRIVE INVERTER

**Thesis presented in partial fulfillment for the award of the Bachelor in Electrical Engineering (Hons) of UNIVERSITI TEKNOLOGI MARA**

AMBROSE YAHYA FENNER
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA
40450 Shah Alam, Malaysia

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Ambrose Yahya Fenner
Universiti Teknologi MARA, Shah Alam

# ABSTRACT

This thesis describes the construction and testing of a new battery driven variable-reluctance (VR) drive inverter. The motor being brushless and robust is a good replacement for conventional D.C. motor that has commutator and brushes that effectively limit its operating life to a few hundreds of hours. The cost of VR drive, however, increases with its phase number with the single-phase VR drive being the cheapest. This thesis discusses the operation of a single-phase VR inverter that operates a pseudo two-phase VR motor to achieve reliable starting at low cost. Only one active switch is required in this inverter. The thesis reports both simulation and experimental performance data of the drive. The simulation and experimental results correlate reasonably well.

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# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction

The principle for the variable-reluctance machines has been known for more than a century. But the rapid developments within power and control electronics during recent decades have made the technology especially interesting today.

Variable-reluctance machines (often abbreviated VRMs) are perhaps the simplest of electrical machines. They consist of a stator with excitation windings and a magnetic rotor with saliency. Rotor conductors are not required because torque is produced by the tendency of the rotor to align with the stator-produced flux wave in such a fashion as to maximize the stator flux linkage that result from a given applied stator current. Torque production in these machines can be evaluated by using the techniques same as magnetic field and the fact that the stator winding inductances are functions of the angular position of the rotor. [1]

Although the concept of the VRM has been around for a long time, only recently have these machines begun to see widespread used in engineering applications. This is due in large part to the fact that although they are simple in construction, they are somewhat complicated to control. For example, the position of the rotor must be known in order to properly energize the phase windings to produce torque. It is only relatively recently that the widespread availability and low cost of micro and power electronics have brought the cost of the sensing and control required to successfully operate VRM drive systems down to a level where these systems can be competitive with systems based on dc and induction motor technologies. [1]

The VR, motor is an electronics motor in that it requires electronics to function. The reason is that the motor current must be switched between the