# AUTOMATIC CONTROL OF TURN ON POSITION CONTROL OF SWITCHED RELUCTANCE MOTOR

This report is present in partial fulfilment for the award of the
Bachelor of Electrical Engineering (Honours)
Of
**UNIVERSITI TEKNOLOGI MARA (UiTM)**

**MOHD AFIQ BIN MAHADZER**

**FACULTY OF ELECTRICAL ENGINEERING**
**UNIVERSITI TEKNOLOGI MARA**
**40450 SHAH ALAM, SELANGOR**

## ACKNOWLEDGEMENT

Alhamdulillah...blessed with His mercy and greatness bestowed upon us, I am able to complete my final year project. With His guidance I endured the problems occurred during the preparation of the final year project.

Firstly, I want to acknowledge my final year project supervisor, Assoc. Prof. Dr Chan Sei for him efforts of teaching and guiding me to prepare the project progress. Secondly, I would like to express my gratitude to all valuable knowledge taught, project advised, supervised; kindness and cooperation the organizations and agencies that have helped me and gave me the information that were needed to complete my final year project, *Automatic Control of Turn on Position Control of Switched Reluctance Motor* .

With my love and gratitude, I want to dedicate this thesis to my family who had support me throughout. They had given me a lot of motivation and support to complete this course. All praise for them especially Mahadzer Bin Hashim and

who has inspired and loved me throughout my life.

Finally, special thanks to all my entire colleague and friend for their support, help and participation in this project friends and deepest gratitude to Nuzrul Farhan for his kindness on technical help to complete this report. And also my thanks to all the persons who are directly or indirectly contributed because their perspective and guidance helped greatly to point me in the right direction until the completion of this thesis.



Mohd Afiq Bin Mahadzer.
Faculty of Electrical Engineering
University Teknologi Mara (UiTM)
Shah Alam, Selangor Darul Ehsan

# ABSTRACT

This project consists of the implementation of Switched Reluctance Motor (SRM) in Matlab Simulation Software. This project presents the modelling, simulation and control aspect of the SRM. A new approach to the automatic control of the turn-on angle for the switched reluctance motor (SRM). Switched reluctance motor output can be varied simply by controlling the switching angles. Such control flexibility however tends to increase considerably the magnitude of the motor design tuning process. In attempting to reduce the amount of design calculation, it is very desirable to be able to define before the design process is started the rated operating condition of a switched reluctance drive in terms of set of switching angles.

An approximately constant mean torque could be achieved if the same mean current value could be maintained during the rising inductance period. It is obviously desirable to minimize switching losses (during current chopping control) to maintain a constant mean torque with a minimum r.m.s phase current at different speeds. This condition may be achieved by adjusting the current switch-on advance angle as speed changes, in such away to maintain the current just before the occurrence of positive incremental inductance equal to the mean chopping current.

A closed form turn on angle equation based on linear SRM model is introduced. The control of SRM is implemented in Matlab. Simulation result is found to be is accordance to theory.

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# CHAPTER 1

# INTRODUCTION

## 1.1 INTRODUCTION OVERVIEW

Since 1969, a variable reluctance motor has been proposed for variable speed applications. The origin of this motor can be traced back to 1842, but the "reinvention" has been possible due to the advent of inexpensive, high-power switching devices. Even though this machine is a type of synchronous machine, it has certain novel features. It has wound field coils of a dc motor for its stator windings and has no coils or magnets on its rotor. Both the stator and rotor have salient poles, hence the machine is referred to as a doubly salient machine. Such a typical machine is shown in Figure 1.1a, and a modified version with two teeth per pole is shown in Figure 1.1b.

The rotor is aligned whenever diametrically opposite stator poles are excited. In a magnetic circuit, the rotating member prefers to come to the minimum reluctance position at the instance of excitation. While two rotor poles are aligned to the two stator poles, another set of rotor poles is out of alignment with respect to a different set of stator poles. Then, this set of stator poles is excited to bring the rotor poles into alignment. Likewise, by sequentially switching the currents into the stator windings, the rotor is rotated. The movement of the rotor, hence the production of torque and power, involves switching of currents into stator windings when there is a variation of reluctance; therefore, this variable speed motor drive is referred to as a switched reluctance motor drive.

Switched Reluctance Machine (SRM) is capable of operating as a motor by adjusting the firing angles and thus changing the direction of the conversion power flow. A SRM operates in motoring by retarding the firing angles so that the bulk of the winding conduction period comes prior/after the aligned rotor position. In motoring