A Formalised Theory of Turing Machines in Isabelle/HOL

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***Abstract*—Isabelle/HOL is an interactive theorem prover based on classical logic. While classical reasoning allow users to take convenient shortcuts in some proofs, it precludes *direct* reasoning about decidability: every boolean predicate is either true or false because of the law of excluded middle. The only way to reason about decidability in a classical theorem prover, like Isabelle/HOL, is to formalise a concrete model for computation. In this paper we formalise Turing machines and relate them to register machines.**

***Keywords*-Turing Machines, Decidability, Isabelle/HOL;**

I. Introduction

Norrish choose the λ-calculus as a starting point for his formalisation, because of its "simplicity" [Norrish]

"Turing machines are an even more daunting prospect" [Norrish]

Contributions: