

Sample Report Using EmitTeX Macros

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Abstract

We demonstrate using the EmitTeX structure functions in HOL to typeset HOL terms, types, theorems, and theories. We use *example1* theory as our example theory to print.

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Chapter 1

Executive Summary

All requirements for this project are satisfied. In particular, we prove the example theorem, pretty print the HOL theory, and make use of the *EmitTeX* structure to typeset HOL theorems in this report.

The following theorems are proved and their corresponding L^AT_EX macros used in this report.

[demoTheorem]

$$\vdash \forall p \ q. \ p \Rightarrow (p \Rightarrow q) \Rightarrow q$$

[prob1Theorem]

$$\vdash \forall p \ q. \ p \Rightarrow (p \Rightarrow q) \Rightarrow q$$

Chapter 2

Proof of prob1Theorem

2.1 Problem Statement

Our task is to prove the theorem

$$\vdash \forall p \, q. \, p \Rightarrow (p \Rightarrow q) \Rightarrow q$$

2.2 HOL Code Proving prob1Theorem

```
val prob1Theorem =
let
  val th1 = ASSUME ‘‘p:bool‘‘
  val th2 = ASSUME ‘‘p ==> q‘‘
  val th3 = MP th2 th1
  val terma = hd (hyp th2)
  val th4 = DISCH terma th3
  val termb = hd (hyp th1)
  val th5 = DISCH termb th4
in
  GENL [‘‘p:bool‘‘, ‘‘q:bool‘‘] th5
end
```

2.3 Session Transcript

```
> val prob1Theorem =
let
  val th1 = ASSUME ‘‘p:bool‘‘
  val th2 = ASSUME ‘‘p ==> q‘‘
  val th3 = MP th2 th1
  val terma = hd (hyp th2)
  val th4 = DISCH terma th3
  val termb = hd (hyp th1)
  val th5 = DISCH termb th4
in
  GENL [‘‘p:bool‘‘, ‘‘q:bool‘‘] th5
end;;;
# # # # # # # # val prob1Theorem =
  |- !p q. p ==> (p ==> q) ==> q:
  thm
```

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Chapter 3

Proof of demoTheorem

3.1 Problem Statement

Our task is to prove the following theorem using PROVE.

$$\vdash \forall p \ q. \ p \Rightarrow (p \Rightarrow q) \Rightarrow q$$

3.2 HOL Code Proving demoTheorem

```
val demoTheorem = PROVE [] (concl prob1Theorem);
```

3.3 Session Transcript

```
> val demoTheorem = PROVE [] (concl prob1Theorem);
Meson search level: ....
val demoTheorem =
  |- !p q. p ==> (p ==> q) ==> q:
  thm
```

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Appendix A

Source Code for example1Script

The following code is from *example1Script.sml*, which is located in a different subdirectory than this file.

```
(***** *)
(* A first example showing how to create a HOL script file to create a *)
(* HOL theory, which allows us to name and save theorems we prove for later *)
(* use. *)
(* Author: Shiu-Kai Chin *)
(***** *)

(***** *)
(* All HOL script files are ML modules, so we need to declare the file *)
(* example1Script as an ML structure. Do this with the "structure: command *)
(* as the very first executable line. The very last executable line is "end" *)
(* *)
(***** *)

structure example1Script = struct

  (***** *)
  (* Note: everything after new_theory must be part of a val assignment, when *)
  (* using Holmake. Otherwise, there will be compilation errors. If you don't *)
  (* want to assign an expression to a name, just use "val _ = <expression>" *)
  (* The "_" indicates that we don't want to have a name. *)
  (***** *)
  open HolKernel Parse boolLib bossLib;

  val _ = new_theory "example1";

  (***** *)
  (* This theorem was proved as part of forwardProofExample.sml *)
  (***** *)
  val prob1Theorem =
  let
    val th1 = ASSUME ``p:bool``
    val th2 = ASSUME ``p ==> q``
    val th3 = MP th2 th1
    val terma = hd (hyp th2)
    val th4 = DISCH terma th3
    val termb = hd (hyp th1)
    val th5 = DISCH termb th4
  in
    GENL [ ``p:bool``, ``q:bool`` ] th5
  end
```

```

(* **** *)
(* If we want to save prob1Theorem as part of example1Theory, we need to *)
(* explicitly save it. *)
(* **** *)
val _ = save_thm("prob1Theorem",prob1Theorem);

(* **** *)
(* Another theorem we proved as part of forwardProofExample.sml *)
(* **** *)
val demoTheorem = PROVE [] (concl prob1Theorem);
(* **** *)
(* If we want to save prob1Theorem as part of example1Theory, we need to *)
(* explicitly save it. *)
(* **** *)
val _ = save_thm("demoTheorem",demoTheorem);

val _ = export_theory ();

end (* structure *)

```