**Toy Type Converter: Bump-and-Go to Timed Toy**

**Final Documentation**

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**Parts:**

* Arduino Uno Kit: comes with most parts needed except Relay, Female & Male Jacks
  + <https://store.arduino.cc/usa/arduino-basic-kit>
* Arduino Uno
  + <https://store.arduino.cc/usa/arduino-uno-rev3>
* 20K resistor
* USB cable for arduino to upload code
* 5V Relay: Tolako 5v Relay Module for Arduino ARM PIC AVR MCU 5V Indicator Light LED 1 Channel Relay Module
  + <https://www.amazon.com/gp/product/B00VRUAHLE/ref=oh_aui_detailpage_o02_s00?ie=UTF8&psc=1>
* Half-size Breadboard
  + <http://adafru.it/64>
* (Breadboarding) Wires
  + <http://adafru.it/153>
* Alligator Clips
  + <http://adafru.it/3255>
* Female Jack input ($1.95)
  + <https://www.adafruit.com/product/1699>
* Male Jack output ($0.95)
  + <https://www.adafruit.com/product/1700>

**Arduino Code Description:**

Controlling a relay with the Arduino Uno Board.

Uses:

* 1K resistor (1)
* 10K resistor (1)
* BC547 transistor (1)
* Relay (1)
* Timed toy

When the button is pressed the toy will turn ON and remain ON until the button is pressed again. The variable “stayON” is used to delay() the program execution with the desired amount of time.

In our case, after the button is pressed the relay will be switched ON, but after 5 seconds will be turned OFF.

When the button is pressed the Arduino board will put pin 7 in HIGH state, meaning 5V on pin 7. This voltage is used to drive the transistor that will switch ON the relay and the load (in our case the toy) will be powered from its main power supply.

**C++ Code:**

int pinButton = 4;

int Relay = 7;

int stateRelay = LOW;

int stateButton;

int previous = LOW;

long time = 0;

long debounce = 500;

int stayON = 5000; //stay on for 5000 ms

void setup() {

pinMode(pinButton, INPUT);

pinMode(Relay, OUTPUT);

}

void loop() {

stateButton = digitalRead(pinButton);

if(stateButton == HIGH && previous == LOW && millis() - time > debounce) {

if(stateRelay == HIGH){

digitalWrite(Relay, LOW);

} else {

digitalWrite(Relay, HIGH);

delay(stayON);

digitalWrite(Relay, LOW);

}

time = millis();

}

previous == stateButton;

}

**Circuit/Breadboard Assembly:**

**Prototype Practice:**

We adapted the Jolly Penguin Race toy to be used with our prototype/ arduino device following these instructions from Husky ADAPT

<http://www.instructables.com/id/Switch-Adapt-Toys-a-Steam-Train-Toy-Made-Accessibl/>