




**Parts:**

- ## Parts:
- 1 Arduino Microcontroller
  - 1 Piezo speaker
  - 1 High torque gear motor (5v)
  - 1 Momentary pushbutton
  - 1 Red LED
  - 1 Green LED
  - 1 NPN Transistor (P2N2222A or similar)
  - 1 Rectifier Diode (1N4001 or similar)
  - 1 2.2k ohm resistor
  - 1 10k ohm resistor
  - 1 3M ohm resistor
  - 2 560 ohm resistors

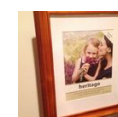


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### Detecting-Door-Lock/)



by AndrewD1

[illegible]

# Secret Knock Detecting Door Lock

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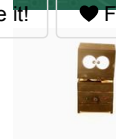
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## Important Notes:

(I hate to even have to say this, but since someone's going to say it, I'll say it first:)

1) *This is for entertainment purposes only. Really. This decreases the security of your door by adding another way to unlock it, and it makes your unlock code known to anyone who can hear. If you put this on your door, be sure to carry your key too. The batteries might die, the suction cups might fail or you might forget your knock. Don't complain to me if someone imitates your knock and steals all your stuff, you've been warned.*

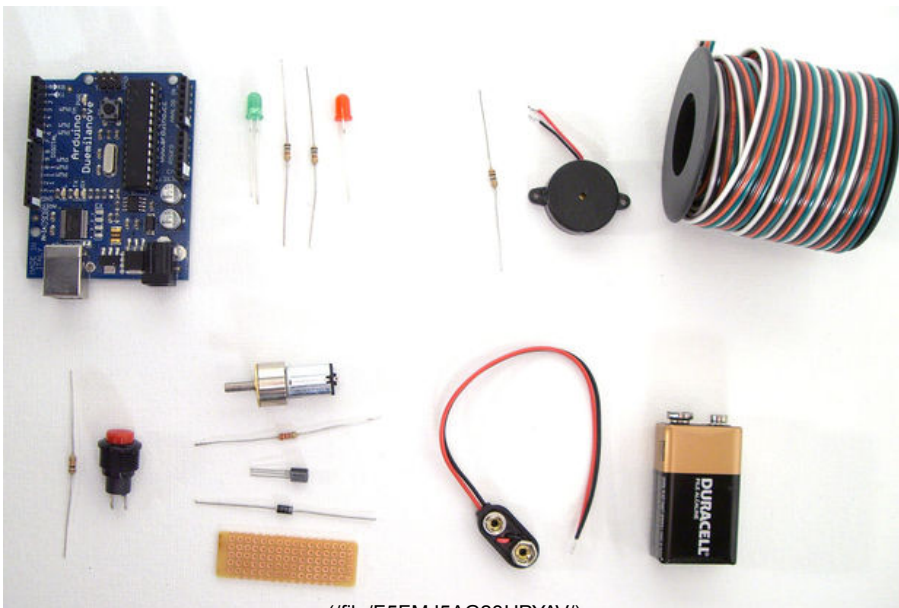
*For obvious improvements to safety, security and whatever, see the final page of the Instructable.*

2) This is not a project for a beginner! Read through it *carefully* and be sure you understand it **before** you start! I will not take time to answer questions that are already in the instructions or from people who have gotten in over their head.

(If you think this project is too complex you might go here ([http://grathio.com/2009/11/knock\\_lock\\_kit\\_update\\_mailing\\_list/](http://grathio.com/2009/11/knock_lock_kit_update_mailing_list/)) and sign up for the kit mailing list. The kits will be much more simple than this.)

Sorry about that. Now that that's out of the way, lets get to work.

## Step 1: Tools, Supplies, and Skills



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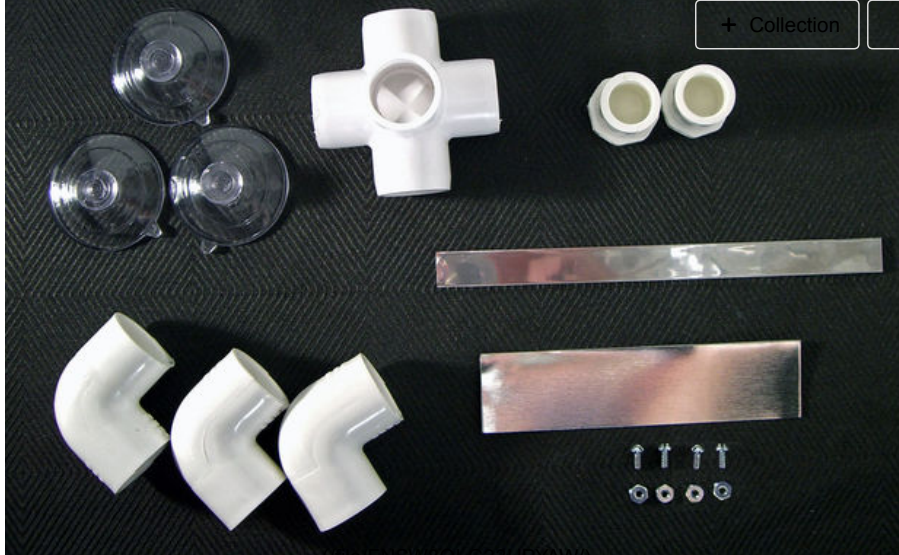
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## Time:

This project will take several hours to complete.

## Skills:

To complete this project you should be able to do the following:

**These are important! If you're not sure if you have these skills, read through the entire Instructable and make sure you understand it before starting anything!**

- Basic soldering.
- Read a basic schematic.
- Basic knowledge of microcontrollers (I'll be using the Arduino (<http://www.arduino.cc/>)). This means you know what one is, how to upload data to it, and how to make minor changes to code.
- Improvisation. There are many ways to do this project, and you will have to make changes based on how your door and lock works.

Note: If you are complaining in the comments that you need the code: YOU HAVE NOT READ THE COMPLETE INSTRUCTABLE and you are now being laughed at.

## Tools:

- Drill (ideally a drill press) and an assortment of drill bits.
- Saw capable of cutting PVC pipe. (ie: Pretty much any saw.)
- Soldering iron and solder.
- Pliers.
- Screw drivers.
- Heat-shrink tubing and/or electrical tape.
- Wire stripper.
- Vice.
- Safety glasses.
- Gloves.

Other things you might find handy: a ruler/tape measure, a multimeter, a breadboard, some tape, a magic marker, sand paper, files, hot glue. And if you're like me a well stocked first aid kit.

## Materials:

(The links are for example only, I don't necessarily recommend or have experience with any of these vendors. Feel free to suggest other sources in the comments.)

## Electronics:

- 1 Arduino Duemilanove (Or compatible. Or really any microcontroller with at least 1 analog input and 3 digital outputs.) Buy from here ([http://www.adafruit.com/index.php?main\\_page=product\\_info&cPath=17&products\\_id=50](http://www.adafruit.com/index.php?main_page=product_info&cPath=17&products_id=50)), here



([http://www.sparkfun.com/commerce/product\\_info.php?products\\_id=666](http://www.sparkfun.com/commerce/product_info.php?products_id=666)), or (<http://www.instructables.com/Arduino-Magtype-Door-Category-Technology/Channel-Around/>), or (<http://www.arduino.cc/en/Main/Buy>).  
Product Code: MKSP41. And other places (<http://www.instructables.com/Arduino-Magtype-Door-Category-Technology/Channel-Around/>).

- 1 5v Gear reduction motor. The higher torque the better. Here's a good one (<http://www.solarbotics.com/products/gm22/>) (14-16mm diameter is ideal because it fits inside of 1/2" PVC pipe.) I recommend one with at least 15oz/in (11 N-cm) of torque at 5v to turn a basic lock. 1
- 1 Piezo speaker. (30mm) similar to this (<http://www.radioshack.com/product/index.jsp?productId=2062397>). You can use larger or smaller ones, smaller will be less sensitive.
- 1 SPST momentary pushbutton. (normally "off")
- 1 Red LED
- 1 Green LED
- 1 NPN Transistor P2N2222A like these (<http://www.oomlout.co.uk/transistors-p2n222a-x10-p-197.html>) or these (<http://www.solarbotics.com/products/tr2222/>) (or similar ([http://www.sparkfun.com/commerce/product\\_info.php?products\\_id=521](http://www.sparkfun.com/commerce/product_info.php?products_id=521))).
- 1 Rectifier Diode (1N4001 or similar) this (<http://www.solarbotics.com/products/d3/>) or this ([http://www.sparkfun.com/commerce/product\\_info.php?products\\_id=8589](http://www.sparkfun.com/commerce/product_info.php?products_id=8589)) will do.
- 1 2.2k ohm resistor (1/4 watt)
- 1 10k ohm resistor (1/4 watt)
- 1 1M ohm resistor (1/4 watt)
- 2 560 ohm resistor (Or whatever will run your red and green LED's at 5v. How to tell. (<https://www.instructables.com/id/Choosing-The-Resistor-To-Use-With-LEDs/>))
- 1 small piece of perf board. 5x15 holes or longer. (example (<http://www.westfloridacomponents.com/HW097/Solderable+Perf-Board+SMALL+Copper+Pad+Circuit+Board.html>))
- 1 9 volt battery clip and 9v battery. (Or any other way you can think of to get 7-12v to the Arduino. A wall adapter like this ([http://www.adafruit.com/index.php?main\\_page=product\\_info&cPath=17\\_22&products\\_id=63&zenid=6e0700cd9c501ca6e2210cb14d5134e7](http://www.adafruit.com/index.php?main_page=product_info&cPath=17_22&products_id=63&zenid=6e0700cd9c501ca6e2210cb14d5134e7)) is a great option so you don't have to worry about batteries running out. 6 AA's would be another option for longer lasting power, but it will bring down the suction cups.)
- Connector wire. 20 gauge or narrower flexible wire in a number of colors for connecting the electronics together.

It's also a good idea to have a breadboard for setting up and testing the circuit before you solder it. We'll be doing this in step 3.

#### Case:

(These items are to make the project as pictured. Feel free to build a completely different and more functional case.)

- 20" PVC Pipe 1/2".
- 3 right angle 1/2" PVC connectors.
- 1 5-way 1/2" PVC connector. (example (<http://www.creativeshelters.com/Fittings/PVC-Structure-Fitting.aspx?fnSource=base&fnSKU=PVC-51>))
- 2 1/2" PVC end plug (<http://www.acehardwaresuperstore.com/charlotte-pvc-plug-12-spg-p-88577.html?ref=42>).
- 3 1 1/2" suction cups. (Available at hardware stores and craft centers.)  
*NOTE: If your door is unsuitable for suction cups then replace these with three end caps ([http://www.grainger.com/Grainger/items/6MZ99?cm\\_mmc=Google%20Base-\\_-Plumbing-\\_-Fittings-\\_-6MZ99](http://www.grainger.com/Grainger/items/6MZ99?cm_mmc=Google%20Base-_-Plumbing-_-Fittings-_-6MZ99)) and you can use adhesive strips or screws to mount the lock.*
- 6" of 1/2" wide by 1/64" thick metal strip (steel, tin, copper, etc.) (available at hardware, craft, and art supply stores.)
- 4.5" of 1" wide metal sheet, 1/32" thick (steel, tin, copper, etc.) (available at hardware, craft, and art supply stores.)
- 2 3/32" x 3/8" screws with nuts. (1/8" will work too if you can't find the smaller ones.)
- 2 1.6M (metric) 16mm screws. Ideally with countersunk heads if you can find them. (For securing the motor. Check your motor specs to see what screws it needs. One motor I tried used 1.6M, the other 2M. You'll probably have to buy long ones and cut them to length.)

1 If you have a torque meter or a torque wrench, apply it to your door lock to get an idea of what torque it will take to open your lock. Use a online conversion tool (<http://www.onlineconversion.com/torque.htm>) to convert between foot/pounds, N/m, etc.



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## Step 2: Program the Arduino

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This section assumes that you know how to connect your Arduino

to a computer

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microcontroller to your computer, compile and upload a sketch. If you don't know how to do that you probably shouldn't be doing this Instructable. But spending some time on this page (<http://arduino.cc/en/Guide/HomePage>) and doing some of the examples and tutorials there might bring you up to speed.

We're going to upload our sketch before doing any of the electronics so we can test the electronics as we go.

### #1: Download

Download the file `secret_knock_detector.pde` at the bottom of this section and copy it to your sketchbook. (Or view the text and cut and paste it into a new sketch.)

(Tip: If the name of the downloaded file is something like "BARS5HS13H8SW.tmp" simply rename it to `secret_knock_detector.ino`. and you're good to go. If the Arduino IDE says "This file needs to be in a sketch folder" click [ok] and let it do its thing.)

### #2:

Open the sketch and compile it. It should compile properly the first go, but it's good to be sure.

### #3:

Connect your Arduino and upload the sketch.

If you have any trouble, check the troubleshooting section (<http://arduino.cc/en/Guide/Troubleshooting>) at the Arduino site.

### Code overview:

For the curious, here's a look at a few bits of code if you're interested in tinkering:

(If you're not curious, go to the next section)

about Line 28:`const int threshold = 4;`

This is the sensitivity of the knock detector. If you get a lot of noise, raise this (up to 1023), if you're having a hard time hearing knocks you can lower it (as low as 1).

about Line 29:`const int rejectValue = 25;`

about Line 30:`const int averageRejectValue = 15;`

Both of these are used to determine how accurately someone has to knock. They are percentages and should be in the range of 0-100. Lowering these means someone must have more precise timing, higher is more forgiving. `averageRejectValue` should always be lower than `rejectValue`.

Settings of about 10 and 7 make it hard for two people to knock the same knock even if they know the rhythm. But it also increases the number of false negatives. (ie: You knock correctly and it still doesn't open.)

about Line 31:`const int knockFadeTime = 150;`

This is a crude debounce timer for the knock sensor. After it hears a knock it stops listening for this many milliseconds so it doesn't count the same knock

more than once. If you get a single knock counted as two then increase this time. If it doesn't register two rapid knocks then decrease it.

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about Line 32:`const int lockTurnTime = 650;`

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This is now many milliseconds we run the motor to unlock the door. How long this should be depends on the design of your motor and your lock. It's okay if it runs a little bit long since I've designed a simple slip clutch into the design, but it's better for all the parts if it doesn't run too much.

about Line 34:`const int maximumKnocks = 20;`

How many knocks we record. 20 is a lot. You can increase this if your secret hideout is protected by devious drummers with good memories. Increase it too much and you'll run out of memory.

about Line 35:`const int knockComplete = 1200;`

Also known as the maximum number of milliseconds it will wait for a knock. If it doesn't hear a knock for this long it will assume it's done and check to see if the knock is any good. Increase this if you're a slow knocker. Decrease it if you're a fast knocker and are impatient to wait 1.2 seconds for your door to unlock.

about Line 39:`int secretCode[maximumKnocks] = {50, 25, 25, 50, 100, 5.....`

This is the default knock that it recognizes when you turn it on. This is weird rhythmic notation since every value is a percentage of the longest knock. If you're having a hard time getting it to recognize "shave and a hair cut" change this to `{100,100,100,0,0,0...` and a simple sequence of 3 knocks will open it.

#### Debugging:

about Line 51:`Serial.begin(9600);`

about Line 52:`Serial.println("Program start.");`

Uncomment these lines to see some debug info on the serial port. There are a few other lines of debugging code set throughout the rest of code that you can uncomment to see what's going on internally.

Be sure to set your serial port to the right speed.

The rest of the code is commented so you can see how it works but you probably won't need to change it if you aren't changing the design.



secret\_knock\_detector

load (https://cdn.instructables.com/ORIG/F1T/DII6/GIYWWK6R/F1TDII6GIYWWK6R.tmp)

(https://cdn.instructables.com/ORIG/F1T/DII6/GIYWWK6R/F1TDII6GIYWWK6R.tmp)

## Step 3: Lay Out and Test the Circuit

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### Parts:

Arduino Microcontroller

- 1 Piezo speaker
- 1 High torque gear motor (5v)
- 1 Momentary pushbutton
- 1 Red LED
- 1 Green LED
- 1 NPN Transistor (P2N2222A or similar)
- 1 Rectifier Diode (1N4001 or similar)
- 1 2.2k ohm resistor
- 1 10k ohm resistor
- 1 1M ohm resistor
- 2 560 ohm resistors

We're going to breadboard the electronics to make sure everything works. If you never make mistakes you can skip this step.

I've provided both a schematic and a layout diagram for the breadboard. Follow whichever one you're the most comfortable with.

We're going to go slowly and check as we go.

## #1: Wire the Piezo Sensor

Solder a pair of 12" (30cm) leads to the Piezo speaker. Connect it between Analog pin 0 and the ground. Also attach the 1M ohm resistor between Analog pin 0 and the ground.

**Test:** With your Arduino plugged into your computer (via USB or Serial cable) and open the Serial Monitor window. (That's the button furthest to the right at the top of the Arduino development environment.) With the Arduino powered on you should see the text "Program start." Tap the piezo speaker and you should see the text "knock starting" and "knock" each time you tap it. Stop for a second or two and you'll probably see "Secret knock failed" or "Door unlocked!"

If you don't see anything or see junk, make sure your serial port is set to 9600 baud and reset the power on the Arduino. If you're sure it's right, then try tapping Shave and a Haircut ([http://en.wikipedia.org/wiki/Shave\\_and\\_a\\_Haircut](http://en.wikipedia.org/wiki/Shave_and_a_Haircut))(Don't forget the two bits. See the video if you don't know it.) and see if you can get the "Door unlocked!" message.

If you get knock messages without tapping it may be too sensitive. If so you'll need to edit the sketch. Around line 27 raise the value of **threshold**. This can be raised as high as 1032 if you have a very sensitive detector.

```
const int threshold = 3; // Minimum signal from the piezo to register as a knock
```

Once you have it working the way you want it you can comment out (or delete)

the lines that start with `Serial1...` We shouldn't need them any more.

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### #2: Wire up the LEDs

Lets wire up some LEDs so we don't have to use a serial cable to see what's going on.

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Connect the red LED to digital pin 4 and green LED to digital pin 5 with their corresponding 560\* ohm resistors in line.

**Test:** If you power the circuit the green LED should light. If not, check your connections and make sure the LED is the right way around. Every time you tap the green led should dim. After tapping the correct sequence the green led should blink a few times. Tapping the wrong sequence should blink the red one.

If none of this happens, check the polarity on your LEDs and all of your connections.

\* Your LEDs might require different resistance.

### #3: Wire the programming button

Solder 8" leads to the button. Connect one side of the button to +5v. The other pin on the button connect to digital pin 2 and, with a 10K resistor to the Ground.

**Test:** Apply power. When you press the button the red light should come on. Hold down the button and tap a simple sequence. When tapping while programming both LEDs should blink. When you're done the pattern you just tapped should repeat on both lights. After playback is complete, the new knock code is saved and the lights wil alternate red and green to tell you so.

### #4: Wire in the motor

Solder 8" of leads to the motor and follow the design/schematic. Be sure to get the diode going the right way and you might want to check the pins on the transistor to be sure they match the diagram. (Some transistors might have the pins in different order.)

**Test:** Power the circuit. Tap the default "Shave and a Haircut" knock. The motor should run for about half a second. If not, check your connections as well as the polarity of the diode.

#### Extra Troubleshooting tips:

- 1) If the motor turns very weakly the diode might be reversed.
- 2) If you need more power on your motor make the following circuit change:  
Move the wire that goes from the motor to +5v to the Vin pin on the Arduino.  
This will supply the motor with 9v (or whatever voltage you're supplying to it.)

**Tip:** Check which way the motor turns. It should turn the same way as you turn your deadbolt lock to unlock it. If not, switch the motor's leads which should reverse the motor.

Congratulations! You have a working secret knock detector!

Now we have to put it into something more permanent that we can stick on our door.

## Step 4: Prepare the Case



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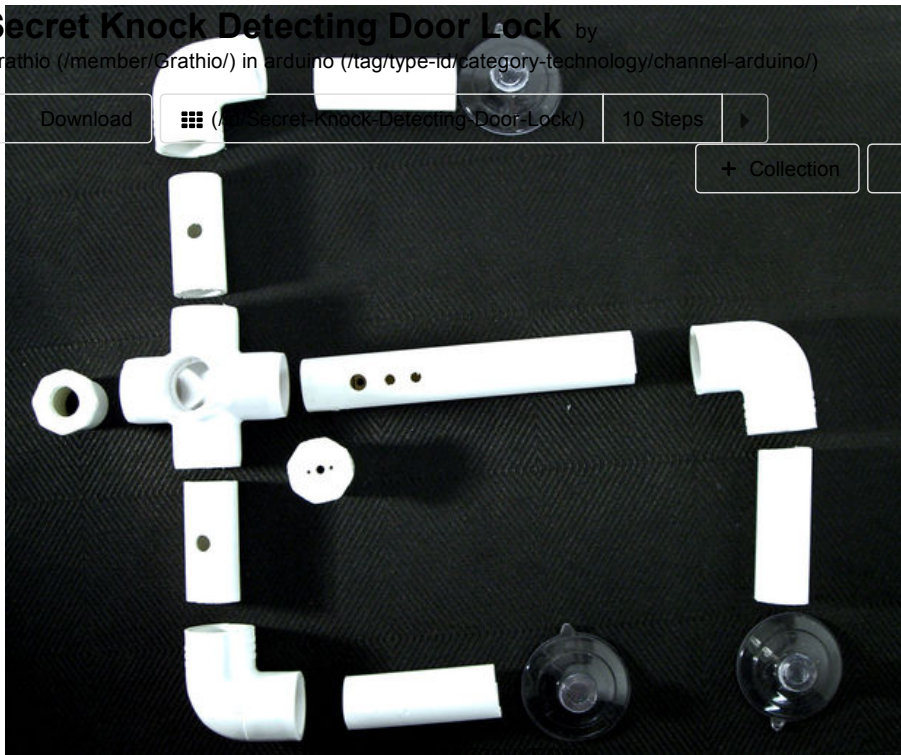
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//616/EKPBDEK0207ETVE/\

If you're making your own case you can skip this step. Otherwise grab your PVC and saw and lets get cracking.

## Important!

We're just testing for fit here. Don't glue or fasten anything yet!

### #1: The Button mount

Take one of the PVC end caps and drill a hole through the center appropriate for your push button. For my button that was 3/8". Secure the button in the hole.

Plug this into one of the 4 radial holes in the 5-way connector. (ie: not the one

that points down.)

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## #2: The Motor mount

Take the other PVC end cap and drill a hole big enough for the shaft of your motor to pass through. You might also need to make it even bigger if your motor has a bearing that sticks out.

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Depending on the design of your motor you may want to sand down the thickness of the plug so that you have more of the motor shaft to work with. Test the fit by placing the motor through the back of the plug. If it's too tight you might have to sand/file/grind the inside of the plug so it will fit.

Use a paper template to place the holes for the fastening screws, drill the holes and attach the motor to the plug. (In my case using the two 2M screws.) Countersink the screws if possible.

Plug this into the "down" facing hole on the 5-way connector.

## #3: The 'arms'

Cut one piece of PVC pipe 5 inches long. We're going to call this the "long arm". Put a right angle connector on one end. Plug the other end into the 5-way connector opposite the button.

Cut two pieces of PVC pipe two inches long. We'll call these the "short arms". Half way along their length drill a 1/4" hole through one side. Put right angle connectors on one end of each arm. Plug these into the two remaining holes on the 5-way connector. You should really start to see it take shape.

## #3b: A Few Extra Holes

with a pencil or marker draw a line down the center of the top and the bottom of the long arm. On the top side, make marks for two holes, one 3/4" from the 5-way, and another 1 1/2" from the 5-way. Drill a 3/16 (5mm) hole at each of these places. This is where our LEDs are going.

Also make a line along the bottom where the long arm connects to the 5-way. Using a saw, cut a short way through the pipe, from the bottom up, until there is about a 1/2" hole into the pipe. (this is where the spring for our detector will attach. Also on the bottom, drill a 1/8" hole 1/4" further along the pipe (Away from the 5-way). We will thread the sensor's wires through here.

## #4: The 'legs'

These are the parts that attach to the door. You may not want to cut these yet, The length depends on the design of your door lock, the length of the shaft on your motor and the final design of the Lock Turning Clamp in the next step. All three of mine were 2 5/16" long, but you're better off cutting them long and trimming them down to size later

If they're too long the motor won't reach the lock to turn it. If they're too short the suction cups won't reach the door.

When you do cut these, hot glue the suction cups in one end and stick the other ends in the right angle connectors on the ends of our legs.

## Step 5: Make the Lock Turning Clamp

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In this section we make the all important part that connects the motor to the lock.

*(This is a reasonably clunky way to do this, but it's simple and cheap. If you think of a better way, please mention it in comments.)*

What we're making is a clamp that attaches to the D-shaft of our motor and fits easily over the lock latch so that it can turn the lock. It attaches securely to the motor, but there is some give in it so that it can slip if it finds its self between a rock and a hard place. (Which we prefer to wrenching the project to pieces.)

## Drilling the holes:

First take the piece of metal that's 4 1/2" long and 1 1/4" tall. and cut it in half so you get two 2 1/4" pieces.

Tape them together, mark each side so you know which side is "out", and mark one of the long edges as "up". This will all help you keep everything lined up as you go.

Measure and mark the center line from top to bottom. 1/2" each side of this center line and 1/4" from the top mark holes for drilling.

Drill 1/8" holes at these marks. Marking the points with a punch, or giving it a whack with a hammer and nail will make your drilling more accurate.

The edge with the holes is the side that attaches to the motor.






## Bending the metal

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Measure the width of your lock latch (the narrow way) and divide by 2. This distance is how much zig we're going to bend into each piece of metal. Mark

this zig distance along each strip. Bend one piece so it zigs to the left, the other so it zigs to the right. Make sure that the screw holes at the top of the pieces stay lined up and the bends don't keep the pieces from meeting at the top.

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### Finishing and sizing

For this part you'll need your motor, the two 1/8" screws and a couple matching nuts.

Put the screws through the holes in the top of the plates so it makes an upside down "Y" (sort of) and place the motor shaft in the top between the screws. Screw nuts on each side and tighten until it's firmly (but not *really* firmly) attached. The small amount of give between the metal and the shaft will let the motor spin if it meets too much resistance. (Rather than breaking something important.)

Check the other end for fit over the lock. It should fit a little loosely over the lock latch. Not so firmly that it's clamped tight, but not so loose that it can turn without turning the lock. Adjust the bend of the flanges if you need to.

After you've got the adjustments right, tighten another nut onto the end of the screws and tighten them up against the first ones. This will help lock them in place.

## Step 6: Make the Knock Detector Spring





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file/E7710B0C207E60D\

file/EGH7E1YG2311Q1Y\

In this section we're going to put our knock detector on the end of a little springy bit so it presses securely up against the door. You could just use a piece of tape or even glue or screw it straight to your door, but doing it this way keeps it portable.

## #1: The parts:

You'll need

- Your strip of thin metal (which is 6" of thin 1/2").
- The piezo sensor (which should have about a foot of leads soldered on.
- The piece of PVC I've been calling the "long arm".

The PVC pipe segment, on the bottom side, should have a slot cut 3/4" from the end and a 1/8" hole just inside of it.

## #2: Attach the sensor to the metal strip.

Using glue, hot glue, tape, etc and fasten the piezo sensor to one end of the metal strip. Wrap some of the remaining wire around the strip so that it stays out of the way.

(If your piezo sensor has its leads on the back then drill a hole through the strip. be sure to cover the leads with insulating tape or heat-shrink.

## #3: Attach the metal strip to the PVC.

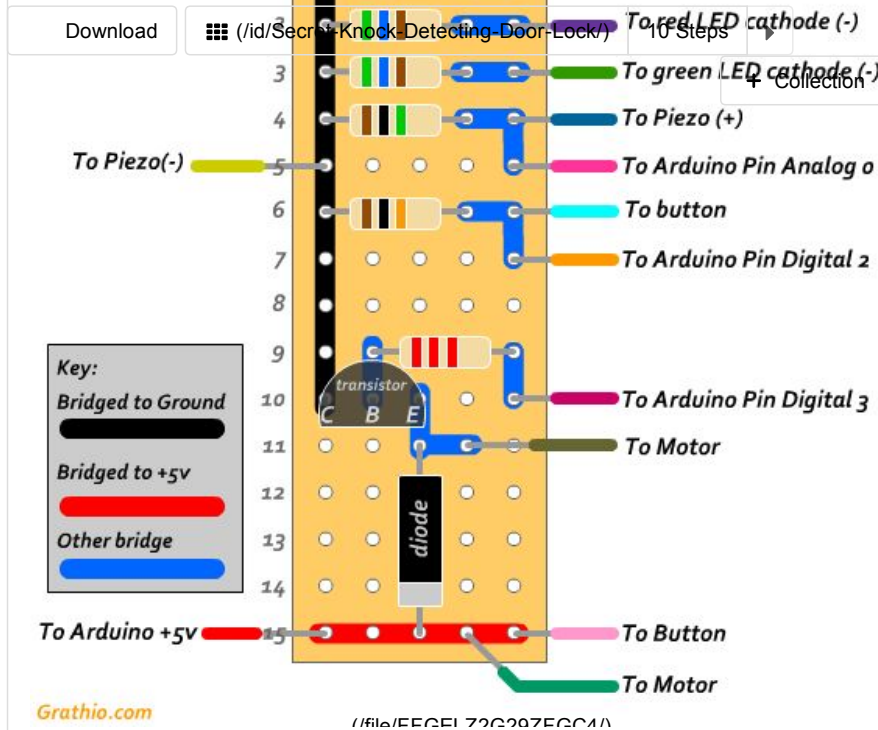
Thread the free end of the wire through the bottom hole on the PVC and then insert the free end of the metal strip in the slot. Bend the strip as shown so that the sensor faces out and down and will lay flat on the door.

The strip should stick in the slot with friction, but if not, take some pliers and bend over the end of ths strip that's inside the pipe.

## Step 7: Soldering the Circuits

# Secret Knock Detecting Door Lock

Grathio member Grathio in arduino (/tag/type-id/category-technology/channel-arduino/)



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(/file/ETA/MCPC207E7H/)

(/file/E40M6SHC221UQ3E3/)

(/file/EBVHADPC221UVK7C/)

(/file/EK30401C221UQ3E4/)

(/file/EP0NVMAC207E6E/)

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Due to the needlessly complex nature of my case, soldering and case mounting are somewhat intertwined, but I'll try to break it down so it makes sense.

I recommend that after each step you plug in and test the circuit to make sure you didn't make a mistake, moving each bit from the breadboard one at a time. Having to desolder components is no fun.

**Tip:** Use wires in as many colors as you can get so you can keep things straight. I also usually put labeled bits of tape on the ends of the wires to help me remember.

**Tip:** If you're using stranded core wire, be sure to tin the ends

(<http://www.ski.org/Rehab/sktf/Soldering/soldering3.html>). It will help with your  
**Secret Knock Detecting Door Lock**  
You can make it easier to solder them into the breadboard for testing.  
Grathio (/member/Grathio/) in arduino (/tag/type-id/category-technology/channel-arduino/)



## #1 Solder leads to the LEDs. (Hey, that almost rhymes!)

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About 10" or so should work.

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Okay, so much for the easy steps. After this it gets more complex because most of the components need to be threaded through various holes in our case before they're soldered. Of course if you made a different case then you don't need to worry about most of the tedium and can get right to soldering the components to the perfboard.

**Tip:** Mount the components as closely as possible to the perfboard. There isn't much clearance inside the pipe.

## #2 Prepare the perfboard.

We're using a perfboard with 0.10" spacing where each hole has an individual copper pad. Cut the perf board to size (5x15 holes) and then sand/file/grind off some of the edges so it fits easily into the 1/2" PCV pipe.

For future reference we're calling the side with the copper "back" and the side with the components the "front".

## #3: The ground line

Since the ground is the most common terminal in the project we're going to run a ground line across the back for the components to connect to. To make this I too a 9 inch piece of solid core wire that I'm using as my ground wire and stripped about an inch off one end. The soldered between hole 1 and hole 10 (see the attached diagram). Then I'll tack the other gronded components to it as the come through the board. (You can also just bridge the connections with solder, but I hate doing that because it can get messy. My soldering is messy enough.)

The other end of this wire will go to a Ground pin on the Arduino. (This is a good time to label the other end with a piece of tape.)

## #4: The +5v line.

There are also a couple points where we want to supply +5v. This is the same idea as the ground line but we only need about half an inch stripped.

The other end of this will connect to the +5v pin on the Arduino.

## #5: The LEDs.

Solder the LED's resistors (560 ohm by default) in place as shown.

You have two choices of how to deal with the LED's. You can mount them on top (the easy way) or you can mount them from the bottom, which looks better, but is a pain because 1/2" PVC doesn't give you much room to work. If you mount them from the top, be sure to thread the leads through the holes before soldering.

Thread all 4 leads from the leds out through the near end of the 'long arm' through the 5-way and through the 'board arm'.


Solder the cathode (-) lead (the short one) from each LED as indicated. The anode will connect to digital pin 4 (red) and 5 (green) on the Arduino. (Thread the Arduinio leads through the "short arm" of the 5-way.)

## #7: The knock sensor.


Solder the speaker's 1M ohm resistor in place on the board.

Make sure you have the speaker mounted firmly at the end of the spring and the wires wound a few times around it to keep it out of the way. Thread the wire through the long leg, through the 5 way and into the short arm that we're keeping the circuit board.

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Solder one end of these leads to each side of the 1M resistor. Then solder a 3" lead from the ungrounded end of the resistor. This will go to Analog pin 0.

**#6: The button.**

Solder the 10K ohm resistor in place as shown.

Fasten the button through the hole on the end plug, then put the plug on the 5-way connector and thread both wires through to the 'board arm' hole.

Solder one lead from the switch to the resistor. The other end to the +5v wire.

Solder a length of wire from the resistor according to the diagram and label it "Digital 2".

**#8: The motor.**

Nearly done.

Solder the diode, transistor and resistor in place. (Make sure you get the direction right on the diode. And the transistor for that matter.)

To the free end of the 2.2k ohm resistor solder a 8" lead that will go to digital pin 3.

Put the motor in place in the bottom hole of the 5-way connector, thread the leads trough and solder them in place on either side of the diode, making sure you've got the motor wires in the right order so when it runs it will turn to unlock.

**#9: The Arduino pins**

Connect the labeled wires to their appropriate places on the Arduino.

**Test:**

Wait, you don't need to do this, right? You've been testing as we go, haven't you?

Plug some power into the Arduino and make everything works. Especially make sure that the motor spins in the right direction to unlock your lock.

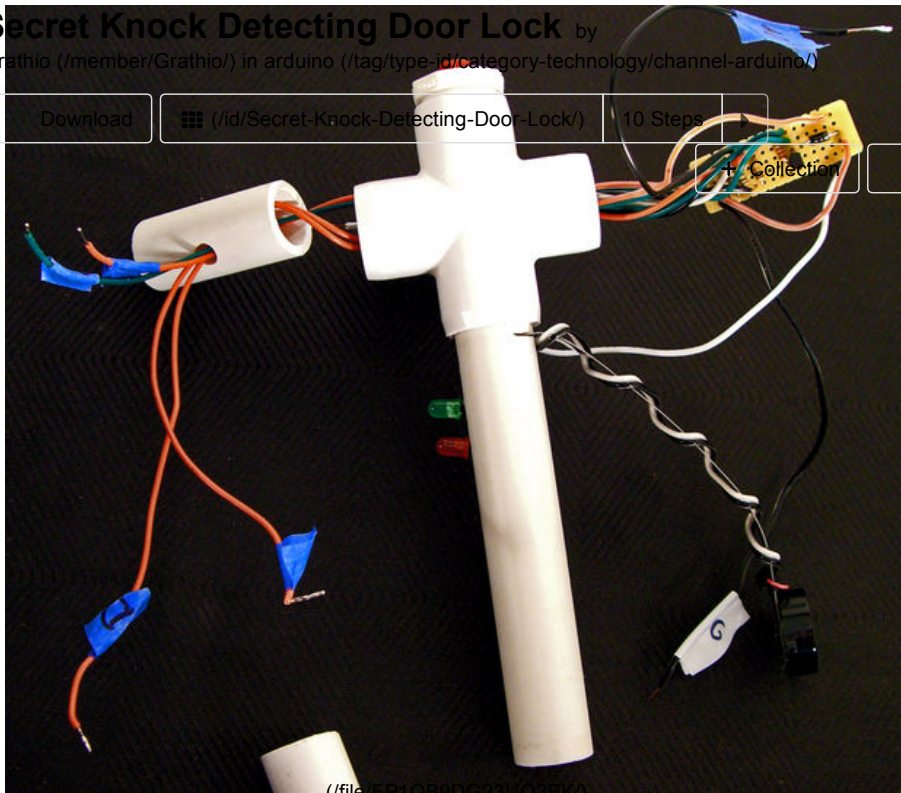
**Step 8: Assembling the Case**





## Secret Knock Detecting Door Lock by

Grathio (/member/Grathio/) in arduino (/tag/type-id/category-technology/channel-arduino/)

[Download](#)[\(/id/Secret-Knock-Detecting-Door-Lock/\)](#)[10 Steps](#)[+ Collection](#)[I Made it!](#)[♥ Favorite](#)[🗣 Share ▾](#)

[\(/file/EVBSAVIC2311VK71/\)](#)

[\(/file/EVKKIHG2311VK7T/\)](#)

[\(/file/EE45110AC207EC00/\)](#)

[\(/file/EP87IT4C2311VK7V/\)](#)

[\(/file/EPH1TMM1C2311Q3E1/\)](#)

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All of your components should be in place and the circuit should be working. We're almost there, all we have to do is cram all that wire and the circuits into the pipe.

### #1 Getting the wires to the correct side.

If you had the wires connected to the Arduino, unplug them.

The wire to Analog 0 and to Ground and +5v will come out of the Board Arm, so we don't do anything with those yet.

# The other wires to Digital 2,3,4 and 5 thread through the 5-way to where the Secret Knock Detecting Door Lock

by Grathio (/member/Grathio/) in arduino (/tag/type-id/category-technology/channel-arduino/)



## #2: The Short Arm

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Speaking of the short arm... Pull the wires for Digital 2,3,4 and 5 through the hole in the middle of the Short Arm pipe.

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## #3: The Long Arm.

The long arm has the LEDs and the sensor in it. Using needle nose pliers, (or a bit of coat hanger with a small hook on the end, or a crochet hook) pull up the slack on these wires as you plug it into the 5-way.

## #4 The circuit board.

The circuit board should be the first part put in place inside the pipe for the Board Arm. Thread the wires for Ground, +5v and, Analog 0 through the small hole on top of the arm.

Now make a tight bundle of the wires around the circuit board putting even pressure on it, being careful not to bend, break or spindle the thing. Gently slide it into the Board Arm. If you have a lot of extra wire lengths you might want to push it out the far side about half an inch so there's more room for wire on the inside.

When it's in place, plug this short arm into the 5-way.

## #5 The Motor.

The motor should already be in place in the bottom of the 5-way. But if it's not nows the time to put it there.

## #6: The Button.

The button should also be in place, but if not, put it in. If you have a bunch of extra wire getting jammed up inside the 5-way, you can try pulling some of it (gently!) to the button side of the 5-way since it doesn't take up much space.

## #7: The legs and suction cups.

The arms should all be plugged in. Attach 90° turns to the ends of the 3 arms, and plug the legs in to the other end.

Suction cups should fit snug into the bottom of the legs. If not, some hot glue will get them into shape.

(If you're not using suction cups then this is where you use your alternate solution.)

## #8: The Arduino and battery

Yes, this is ugly as sin. I works, but... yeah. If you come up with anything better, you're welcome to it.

Stick the Arduino onto the top of the frame. I used lengths of insulated wire. It worked...

Attach the battery in a similar way somewhere where it can power the Arduino. Again, I used insulated solid core wires. At one point I used rubber bands which also worked just fine.

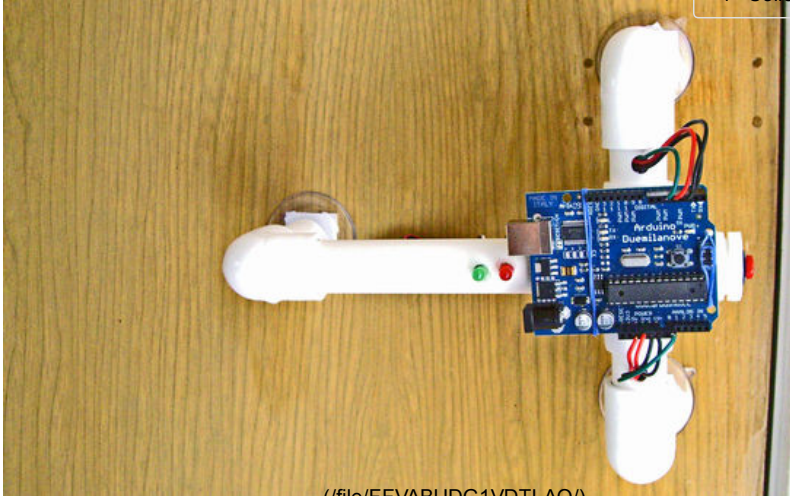
Tape? Yes, that would work too.

Plug in the wires in where they labels say they should go. Might as well test again it since it's all hooked up.



**Step 9: Mounting, Testing, and Use** 10 Steps ▶

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First lets make sure our legs are the right length. Be sure the lock clamp is attached to your motor and the legs are in place. Attempt to fasten it to the door so the clamp fits over your lock. If you're lucky the legs will be the right length and you're ready to go! If you're unlucky the legs are too short and you'll have to cut new ones. But chances are your legs will be too long. Either grind/file/sand/cut them to the right length so the clamp fits right over the deadbolt lock handle.

You don't have to use suction cups and in fact may doors are immune to their sucking. Two other options are to put PVC end caps on the legs and then secure them to the door with double sided foam tape (like this (<http://www.amazon.com/Thick-Double-Urethane-Acrylic-Adhesive/dp/B00136WDKK>)) or with screws through the caps, if you don't mind putting holes in your door.

Now that's its on you can give it a test. Do the first test from the inside. Lock your door and power it up. When the green light is on give it the old *Shave and a Haircut* and it should unlock!

Now program in a less obvious knock (or not) and your tree house will finally be safe from that smelly kid!

If the motor doesn't turn far enough to unlock your door you'll need to update the sketch to run the motor longer. (See Step 2!)

**For additional Troubleshooting:** See the bottom of **Step 2**. It also includes a bunch of other tweaks that might help you.

## Step 10: Epilog: Changes and Improvements



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(/id/Secret-Knock-Detector/Secret-Knock-Detector/)

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There are many ways to improve or change this project if you're feeling ambitious. Here are a few to get you started, feel free to add more in the comments.

- Add an H-Bridge ([https://www.instructables.com/tag/?q=h+bridge&limit%3Atype%3Aid=on&type%3Aid=on&type%3Auser=on&type%3Acomment=on&type%3Agroup=on&type%3AforumTopic=on&type%3AforumTopic=on&sort=none](https://www.instructables.com/tag?q=h+bridge&limit%3Atype%3Aid=on&type%3Aid=on&type%3Auser=on&type%3Acomment=on&type%3Agroup=on&type%3AforumTopic=on&type%3AforumTopic=on&sort=none)) to the circuit so it can lock and unlock the door.
- Make it work in silent mode by removing the knock sensor and attach a capacitance (touch) sensor to the doorknob and record sequences of touches.
- Use a servo to unlock (<http://makezine.com/projects/make-25/secret-knock-gumball-machine/>) the door rather than this hacked together gear-motor+slip transmission.
- Add a potentiometer to adjust the knock sensitivity and other values.
- Build it into an actual door knocker.
- Use a more economical microcontroller and enable sleep mode for better battery life.
- Make the whole package small enough to fit inside the door.
- Store several knocks so several people can have their own 'private' knocks.
- Add a real-time clock and using different knocks for different days of the week.
- Add a knocker to provide feedback through the door. It could then offer a challenge-response security where the door starts a knock sequence and the user has to finish it correctly.
- Remove the knock sensor and record pushes of the doorbell or other hidden button.
- Remove the knock sensor and put a photosensor in the peephole, send the open code through the peephole with a keychain flashlight.

And here's a zero-technology solution to the "*Yeah, but someone'll overhear your secret knocks!*" problem: Scream while knocking. No one will overhear the knock over the racket you're making.

Please post photos and/or videos of your build!

Everyone builds them differently, and I love to see what you come up with! For example...





# Masters of Secret Knocks: Secret Knock Detecting Door Lock

Grathio (/member/Grathio/) in Arduino May type is category Technology made it and added a servo and locking ability (https://www.instructables.com/id/Secret-Knock-Detecting-Door-Lock/#C580TZBG30TY24Z).

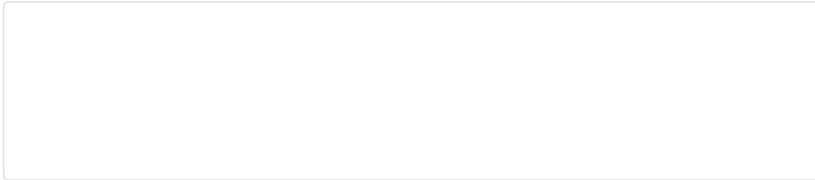
- Jorad (/https://www.instructables.com/member/Jorad/) uploads his door (http://www.youtube.com/watch?v=zBNTQkVUHvw&feature=player\_embedded) and added feedback in the peephole (http://www.youtube.com/watch?v=ZGCKVcrUNXM&feature=player\_embedded).
- Crimson-Deity (https://www.instructables.com/member/Crimson-Deity/) added a pushbutton (http://www.youtube.com/watch?v=V6X6jEcNDY8).
- bserrato (https://www.instructables.com/member/bserrato/) added unlocking and a bluetooth camera to photograph people who give an incorrect knock (http://www.youtube.com/watch?v=6k6XwyB8Hh0).

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We have a be nice comment policy. Please be positive and constructive.

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Post Comment



Matienzo (/member/Matienzo)

3 years ago

Reply

here is my little one in an iphone box



mugilen9 (/member/mugilen9) ▶ Matienzo (/member/Matienzo)

Reply

can i get the coding ? pls email me stylo.mugilen@gmail.com  
thanks

5 months ago



Salma salah (/member/Salma salah) ▶ mugilen9 (/member/mugilen9)

Reply

Got it ?

5 months ago



achment99 (/member/achment99) ▶ Salma salah (/member/Salma salah)

Reply

how do i get the code?

a month ago

I have premium account but i still cant get the codes where do i click to get it?

thanks



Sucheth17 (/member/Sucheth17) made it!




2 years ago

Reply

I have made a prototype, still have to assemble it to my door. I used a self made  
**Secret Knock Detecting Door Lock** in arduino (/tag/type-id/category-technology/channel-arduino/)

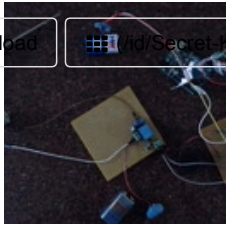


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(<https://cdn.instructables.com/F1O/M3DN/IE7J5KGX/F1OM3DNIE7J5KGX.LARGE.jpg>)



**Tàid4 (/member/Tàid4)** ▶ Sucheth17 (/member/Sucheth17) a year ago 

Reply

why I do like you, but it does not work.reply  
shivaduy248@gmail.com,please



**NeilR8 (/member/NeilR8)** 2 years ago 

Reply

Cheers, I turned this into a geocache, and built it into a ammo can =)  
<https://www.youtube.com/watch?v=ufl1bx3c7rg>



**VisionaryNutcases (/member/VisionaryNutcases)** made it! 2 years ago 

Reply

My version is installed in a fridge and using an electromagnetic lock - keep those office thieves away!

[http://ink361.com/app/users/ig-240858804/jas\\_cal/photos/ig-870056726990911200\\_240858804](http://ink361.com/app/users/ig-240858804/jas_cal/photos/ig-870056726990911200_240858804)



(<https://cdn.instructables.com/F9N/14DE/I3BHEGHT/F9N14DEI3BHEGHT.LARGE.jpg>)



(<https://cdn.instructables.com/FI5/NR9T/I3BHEGJQ/FI5NR9TI3BHEGJQ.LARGE.jpg>)



**andreschangv (/member/andreschangv)** ▶ VisionaryNutcases (/member/VisionaryNutcases) 2 years ago 

Reply

excelente



**Krizbleen (/member/Krizbleen)** made it! 2 years ago 

Reply

Guys - thank you for this tutorial! I used the code to program a secret sliding library door project and it works great. The secret knock is the part people like the best. People giggle when I show it to them. I owe you a beer!

<https://www.instructables.com/id/Automatic-Secret-Library-Door/>

# Secret Knock Detecting Door Lock by

Grathio (/member/Grathio/) in arduino (/tag/type-id/category-technology/channel-arduino/)

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Grathio (/member/Grathio/) (author) ▶ Krizbleen (/member/Krizbleen)

Reply

Fantastic work! I love how well the bookshelf hides your secret room. Never would have guessed it was a pocket door. 2 years ago

Thanks for sharing!



KGuy (/member/KGuy)

3 years ago

Reply

Here we are! Finally done after months of procrastination! I added a buzzer and a third led (not in the picture). The code was changed very slightly but it works perfectly. A latch in the back hangs it on the door. I must thank you, however for the genius of this invention.



(https://cdn.instructables.com/F1G1RMNHRCK2L6Y/F1G1RMNHRCK2L6Y.LARGE.jpg)



Eloisa CamelIM (/member/Eloisa CamelIM) ▶ KGuy (/member/KGuy)

Reply

hi sir, how did you do this one. where do i put the new code for the led and the piezo.. please, needed for a presentation, our prof. did not give us enough time to master this. and it serves as our final exam.. thank you in advance.. 2 years ago



Grathio (/member/Grathio/) (author) ▶ KGuy (/member/KGuy) 3 years ago

Reply

Beautiful work! Thanks for sharing!

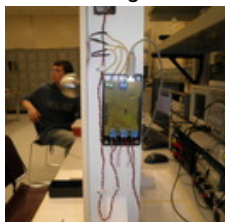


vinny03 (/member/vinny03)

6 years ago

Reply

I have modified the Arduino code to add the functionality of "Users". What it does is that it let you program a secretCode for four users. For example: If you push the button X times, after 4 seconds the green LED will blink X times and then you enter program mode (simply do your secret code). I also added the functionality to take a picture when your sequence is bad with LabVIEW and a WebCam camera. Then the picture is saved in my folder and pictures are incrementing with numbers.



(https://cdn.instructables.com/FH9/R8MO/GO14I8IC/FH9R8MOGO14I8IC.LARGE.jpg)

# Secret Knock Detecting Door Lock by

Grathio (/member/Grathio/) in arduino (/tag/type-id/category-technology/channel-arduino/)



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**Grathio (/member/Grathio)** (author) ▶ vinny03 (/member/vinny03)

Reply

6 years ago

Looks great, and really nice added features! I had done a version with his & hers knocks, but this goes well beyond that!

Fantastic job!



**bserrato (/member/bserrato)**

6 years ago

Reply

I saw your project some time back and I thought it was great. I decided to take it and improve on it, the result was a system that locks and unlocks. Also if a person inputs an incorrect knock, the system will send a signal via bluetooth to a computer terminal to snap a picture and save it.

<http://www.youtube.com/watch?v=6k6XwyB8Hh0>  
(<http://www.youtube.com/watch?v=6k6XwyB8Hh0>)

Check out the vid. Hope you like it.



**Grathio (/member/Grathio)** (author) ▶ bserrato (/member/bserrato)

Reply

6 years ago

That really made my week! It looks fantastic and works great. And the bluetooth camera is a great idea of added security.



**josiasfilho (/member/josiasfilho)**

7 years ago

Reply

Hi Steve!

As you know, I already started to do mine, with a few modifications. I uploaded a new video with a new option:

Arduino project - Update 1



As soon as I finish my project I'll post the code online



**berr08 (/member/berr08)** ▶ josiasfilho (/member/josiasfilho)

7 years ago

Reply

Did you finish yet? Can't wait to see the code.



# Secret Knock Detecting Door Lock

Grathio (/member/Grathio) (author) by josiasfilho (/member/josiasfilho) 7 years ago

Download

 (/id/Secret-Knock-Detecting-Door-Lock/)

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▶

It looks like your setup is really sensitive. Really nicely done!  
Your achievement patch is on the way!


Collection

I Made it!

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 **TheBestJohn (/member/TheBestJohn)** 7 years ago Reply

I have been playing around with this code for the past hour or so and found out how you can hard code in your own rhythm if need be.... at the part that looks like this

```
// If we're recording a new knock, save the info and get out of here.  
if (digitalRead(programSwitch)==HIGH){  
  for (i=0;i<maximumKnocks;i++){ // normalize the times  
    secretCode[i]= map(knockReadings[i],0, maxKnockInterval, 0, 100);  
  }  
}
```

add this little guy

```
Serial.println(secretCode[i]);
```

and open up your serial monitor....

make sure you un-commented the serial begin up at the setup and then it should spit some numbers back at you... put these numbers into the array and enjoy.

 **TheBestJohn (/member/TheBestJohn)** ▶ TheBestJohn (/member/TheBestJohn) 7 years ago Reply

Introducing John's Secret Knock Detecting Lock



Whoot finally got my relays for my motor and heres a neat little Idea for your visual feedback....


 **TheBestJohn (/member/TheBestJohn)** ▶ TheBestJohn (/member/TheBestJohn) 7 years ago Reply

# Secret Knock Detecting Door Lock

Utilizing the peephole by Grathio (/member/Grathio/) in arduino (/tag/type-id/category-technology/channel-arduino/)



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 (/id/Secret-Knock-Detecting-Door-Lock/)

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**Grathio (/member/Grathio)** (author) ▶ **TheBestJohn (/member/TheBestJohn)**

Oh, and for your awesome work you have been added 7 years ago as an official Master of Secret Knocks. Your patch is on its way!

Reply



**Grathio (/member/Grathio)** (author) ▶ **TheBestJohn (/member/TheBestJohn)**

This is awesome! Thanks for sharing your code and video. Having the door unlatch too makes it that much more mysterious. And I like the feedback through the peephole.

7 years ago

Reply

Great work!

And if I ever have any questions about taping something to something else I'll be asking you. :)



**achment99 (/member/achment99)**

a month ago

Reply

hello,

can anyone tell me how to get the codes?

I have premium account but i still cant get the codes where do i click to get it?

thanks



**mathewvgarcia (/member/mathewvgarcia)** made it!

2 years ago

Reply

This was berry helpful thank you. I'm working on a music box for my wife and I though I would add the Knock detector to make it a little more fun. Thank you!

Arduino knock lock stepper motor zelda music box



# Secret Knock Detecting Door Lock by

Grathio (/member/Grathio/) in arduino (/tag/type-id/category-technology/channel-arduino/)

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elvisronghui (/member/elvisronghui) ▶ mathewvgarcia (/member/mathewvgarcia)

give me the code please!

4 months ago

Reply



Thong R Less (/member/Thong R Less)

4 months ago

Reply

I have a problem. I downloaded the code but it is in .tmp. You said i just rename it in .pde and I'm good to go. But it doesn't work. Can someone help me? Arduino IDE says he can only open .pde or .ino. Thanks in advance:)

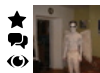


lukaounderground (/member/lukaounderground)

4 months ago

Reply

can i get the coding ? pls email me alesadrolucas@yahoo.com



T0BY (/member/T0BY)

4 months ago

Reply

Brilliant idea! I love your disclaimer! Someone tried to twist my arm into putting a disclaimer on my angel wings saying that you can't actually use them to fly but I wouldn't.



RedRoseate (/member/RedRoseate)

5 months ago

Reply

what if i want to control with my voice...?? like some secrete code answer plz



mugilen9 (/member/mugilen9)

5 months ago

Reply

i can't find the coding!!! please do anyone email me stylo.mugilen@gmail.com  
thanks



MizanR5 (/member/MizanR5)

5 months ago

Reply

Tq very much..this project is very good...im new in arduino....but i still can finish it....this project helps me a lot



liao1008611 (/member/liao1008611)

6 months ago

Reply

Hallow. can you give me this procedure.think you.



RaghavR7 (/member/RaghavR7)

10 months ago

Reply

how is the the buzzer used in this project?



RaghavR7 (/member/RaghavR7)

10 months ago

Reply

how is the the buzzer used in this project?

# Secret Knock Detecting Door Lock

Grathio (/member/Grathio/) in arduino (/tag/type-id/category-technology/channel-arduino/) please give me a code... I am a 7th grade student..so I don't have money to

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upgrade this account to premium (/id/Secret-Knock-Detecting-Door-Lock/)

10 Steps

pls dg8915@naver.com

+ Collection

I Made it!

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제한치 (/member/제한치)

10 months ago

Reply

where is the code????????????



Aneriah (/member/Aneriah)

11 months ago

Reply

What is the total cost of all the supplies. I am starting from scratch and dont have any of the parts.



AdamA114 (/member/AdamA114)

11 months ago

Reply

You should do the same by clap hands to switch on the ligths



Zulfiqar A (/member/Zulfiqar A)

11 months ago

Reply

I have nearly finished my work with the frame and made the breadboard prototype which did not work out. I have an issue with the status lights and even my geared motor does not respond. I checked my connections a couple of time but dint find a solution. Could you please send me a schematic for a solder less breadboard that would run on 9v bat. I'd appreciate you sending me a video related to assembling the breadboard if possible . Thanks.

email: nusrathreyaz@gmail.com



Zulfiqar A (/member/Zulfiqar A)

11 months ago

Reply

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Zulfiqar A (/member/Zulfiqar A)

11 months ago

Reply

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email: nusrathreyaz@gmail.com



Zulfiqar A (/member/Zulfiqar A)

11 months ago

Reply

hi



KevinK513 (/member/KevinK513)

a year ago

Reply

Great project. I was wondering if anyone could recommend a small cheap microprocessor that could be used in place of the arduino?

# Secret Knock Detecting Door Lock

by Arghun Sathyan (member/Arghun Sathyan) made it a year ago



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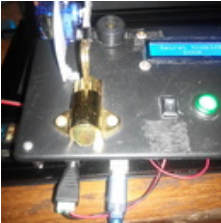
(/id/Secret-Knock-Detecting-Door-Lock/)

10 Steps



my friend and I have made it, but we're using different code, we made the code by ourself, because your program was not working for us, we don't know why. I Made it! and we add some features : LCD 16x2, servo, and buzzer

we inspired by yours,



(https://cdn.instructables.com/FAB/5C4P/IN23610K/FAB5C4PIN23610K.LARGE.jpg)



CristianA3 (/member/CristianA3)

a year ago

Reply

very good



bsrhardy (/member/bsrhardy)

a year ago

Reply

Hey, this is a really cool project and I have got it completed. Two items that are vexing me. 1. The motor runs all the time, but stops for 650 when the knock is applied correctly (polarity maybe?) I know it is a simple fix, but it is just escaping me. 2. The NPN transistor gets smoking hot. I have the correct resistor and even changed it out with a new one. Still getting hot (very). Thoughts. I love this and we are adding it into our business. Thanks for the help. I will send you a pic of the final project if you would like. It is eventually going to run a 12V relay to a maglock.

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