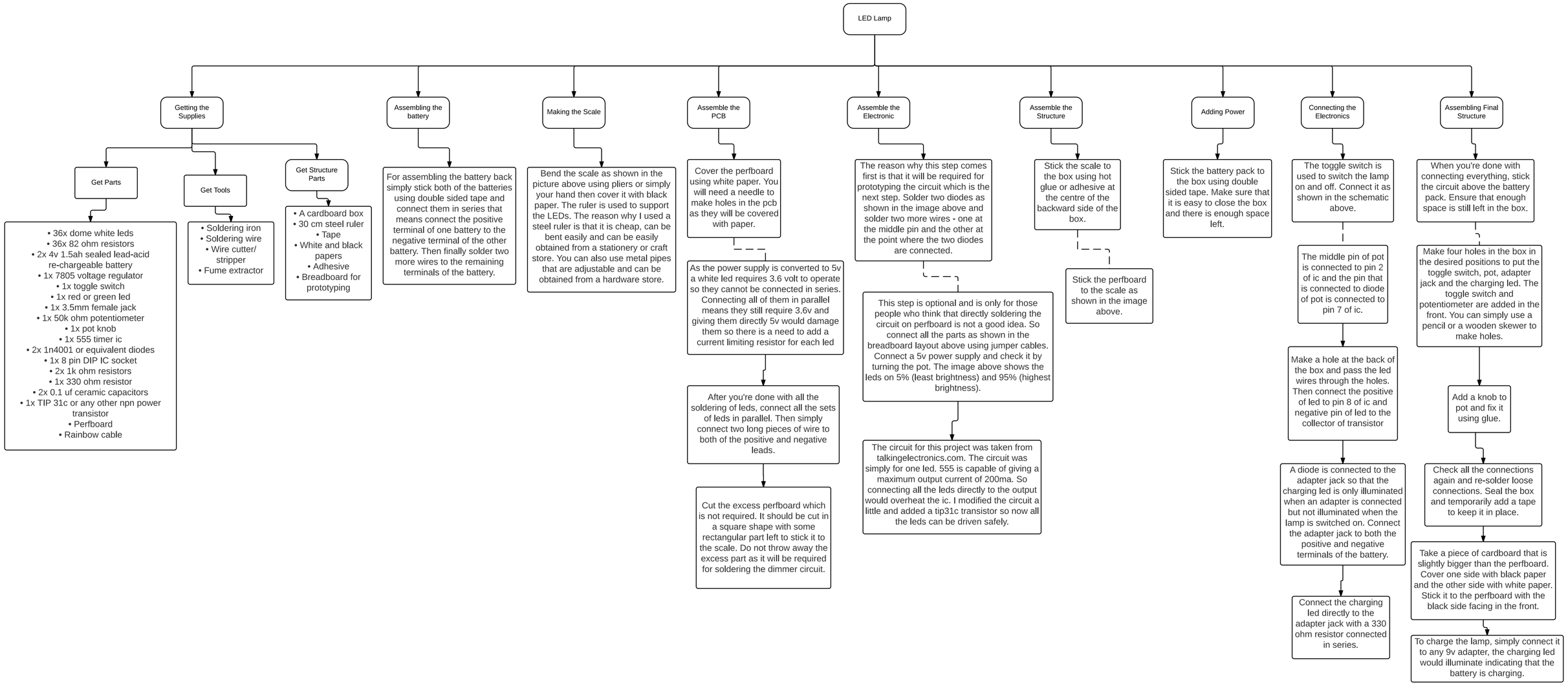
LED Lamp
Getting the Supplies
Get Parts
• 36x dome white leds
• 36x 82 ohm resistors
• 2x 4v 1.5ah sealed lead-acid re-chargeable battery
• 1x 7805 voltage regulator
• 1x toggle switch
• 1x red or green led
• 1x 3.5mm female jack
• 1x 50k ohm potentiometer
• 1x pot knob
• 1x 555 timer ic
• 2x 1n4001 or equivalent diodes
• 1x 8 pin DIP IC socket
• 2x 1k ohm resistors
• 1x 330 ohm resistor
• 2x 0.1 uf ceramic capacitors
• 1x TIP 31c or any other npn power transistor
• Perfboard
• Rainbow cable
Get Tools
• Soldering iron
• Soldering wire
• Wire cutter/ stripper
• Fume extractor
Get Structure Parts
• A cardboard box
• 30 cm steel ruler
• Tape
• White and black papers
• Adhesive
• Breadboard for prototyping
Assembling the battery
For assembling the battery back simply stick both of the batteries using double sided tape and connect them in series that means connect the positive terminal of one battery to the negative terminal of the other battery. Then finally solder two more wires to the remaining terminals of the battery.
Making the Scale
Bend the scale as shown in the picture above using pliers or simply your hand then cover it with black paper. The ruler is used to support the LEDs. The reason why I used a steel ruler is that it is cheap, can be bent easily and can be easily obtained from a stationery or craft store. You can also use metal pipes that are adjustable and can be obtained from a hardware store.
Assemble the PCB
Cover the perfboard using white paper. You will need a needle to make holes in the pcb as they will be covered with paper.
As the power supply is converted to 5v a white led requires 3.6 volt to operate so they cannot be connected in series. Connecting all of them in parallel means they still require 3.6v and giving them directly 5v would damage them so there is a need to add a current limiting resistor for each led
After you're done with all the soldering of leds, connect all the sets of leds in parallel. Then simply connect two long pieces of wire to both of the positive and negative leads.
Cut the excess perfboard which is not required. It should be cut in a square shape with some rectangular part left to stick it to the scale. Do not throw away the excess part as it will be required for soldering the dimmer circuit.
Assemble the Electronic
The reason why this step comes first is that it will be required for prototyping the circuit which is the next step. Solder two diodes as shown in the image above and solder two more wires - one at the middle pin and the other at the point where the two diodes are connected.
This step is optional and is only for those people who think that directly soldering the circuit on perfboard is not a good idea. So connect all the parts as shown in the breadboard layout above using jumper cables. Connect a 5v power supply and check it by turning the pot. The image above shows the leds on 5% (least brightness) and 95% (highest brightness).
The circuit for this project was taken from talkingelectronics.com. The circuit was simply for one led. 555 is capable of giving a maximum output current of 200ma. So connecting all the leds directly to the output would overheat the ic. I modified the circuit a little and added a tip31c transistor so now all the leds can be driven safely.
Assemble the Structure
Stick the scale to the box using hot glue or adhesive at the centre of the backward side of the box.
Stick the perfboard to the scale as shown in the image above.
Adding Power
Stick the battery pack to the box using double sided tape. Make sure that it is easy to close the box and there is enough space left.
Connecting the Electronics
The toggle switch is used to switch the lamp on and off. Connect it as shown in the schematic above.
The middle pin of pot is connected to pin 2 of ic and the pin that is connected to diode of pot is connected to pin 7 of ic.
Make a hole at the back of the box and pass the led wires through the holes. Then connect the positive of led to pin 8 of ic and negative pin of led to the collector of transistor
A diode is connected to the adapter jack so that the charging led is only illuminated when an adapter is connected but not illuminated when the lamp is switched on. Connect the adapter jack to both the positive and negative terminals of the battery.
Connect the charging led directly to the adapter jack with a 330 ohm resistor connected in series.
Assembling Final Structure
When you're done with connecting everything, stick the circuit above the battery pack. Ensure that enough space is still left in the box.
Make four holes in the box in the desired positions to put the toggle switch, pot, adapter jack and the charging led. The toggle switch and potentiometer are added in the front. You can simply use a pencil or a wooden skewer to make holes.
Add a knob to pot and fix it using glue.
Check all the connections again and re-solder loose connections. Seal the box and temporarily add a tape to keep it in place.
Take a piece of cardboard that is slightly bigger than the perfboard. Cover one side with black paper and the other side with white paper. Stick it to the perfboard with the black side facing in the front.
To charge the lamp, simply connect it to any 9v adapter, the charging led would illuminate indicating that the battery is charging.