

Two-Finger Input with a Standard Touch Screen

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Demo

Do this with a standard four-wire touch screen:

- Paint
- Whole-hand selection
- Disk scratching
- Pan, zoom, rotate
- Rotary knobs (debatable)



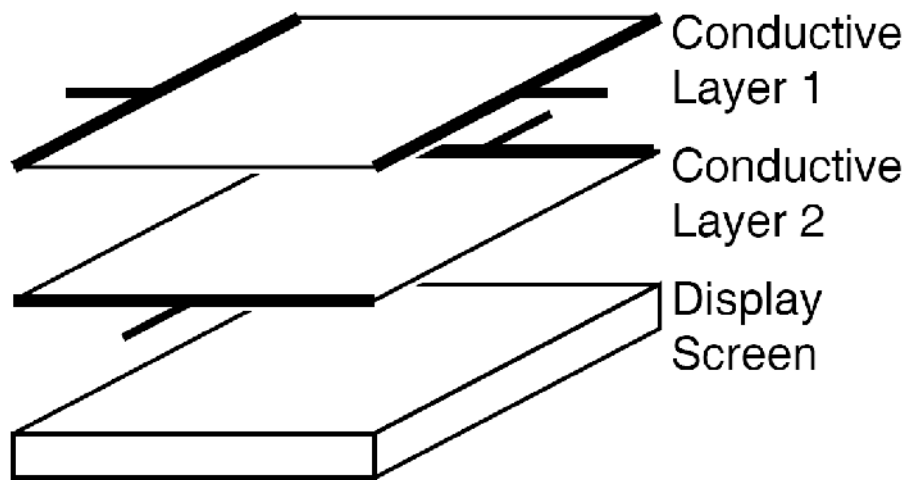
Video

Related Work

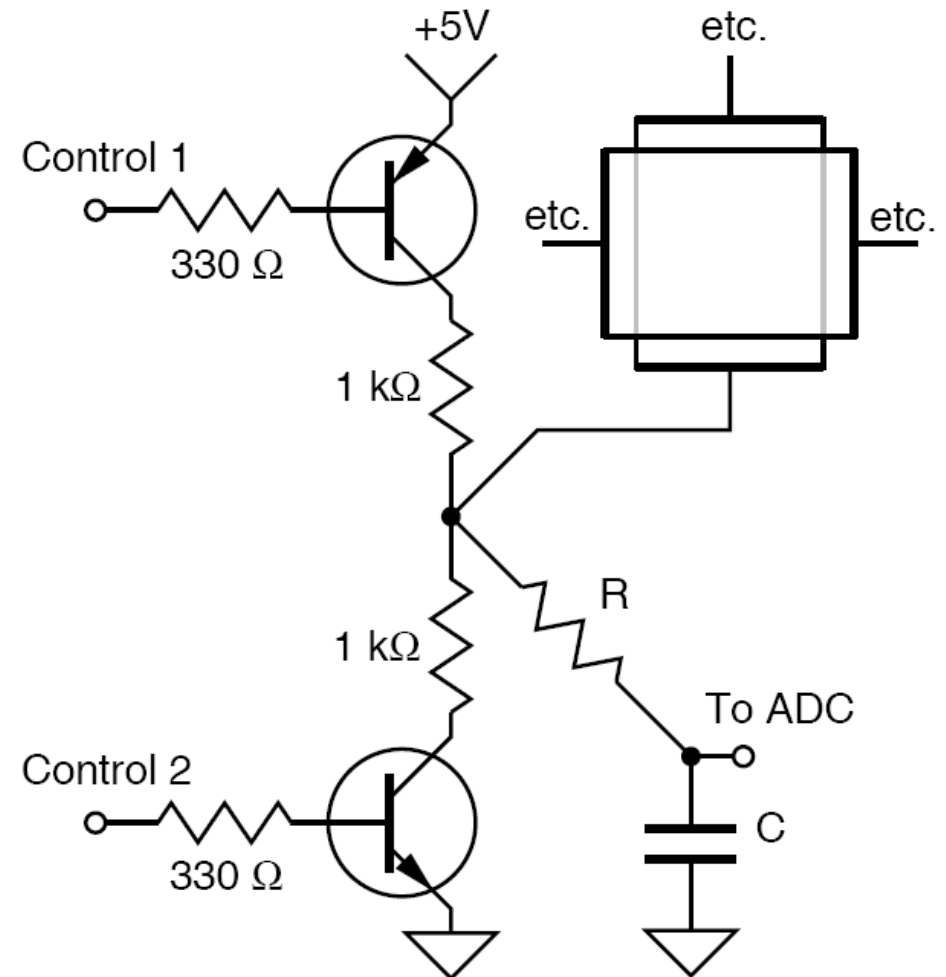
- Midpoint output of standard touch screen
- Capacitive sensing
SmartSkin, Diamond Touch, iPhone
- Camera(s) behind
Frustrated total internal reflection, TouchLight, Surface
- Cameras in the bezel
LG.Philips, NextWindow
- Light sensors at every pixel
Sharp, Toshiba Matsushita, Planar Systems
- Many active IR sensors
ThinSight
- Touch from behind
LucidTouch

Hardware

- Measure a variety of resistances and voltage drops among the four wires

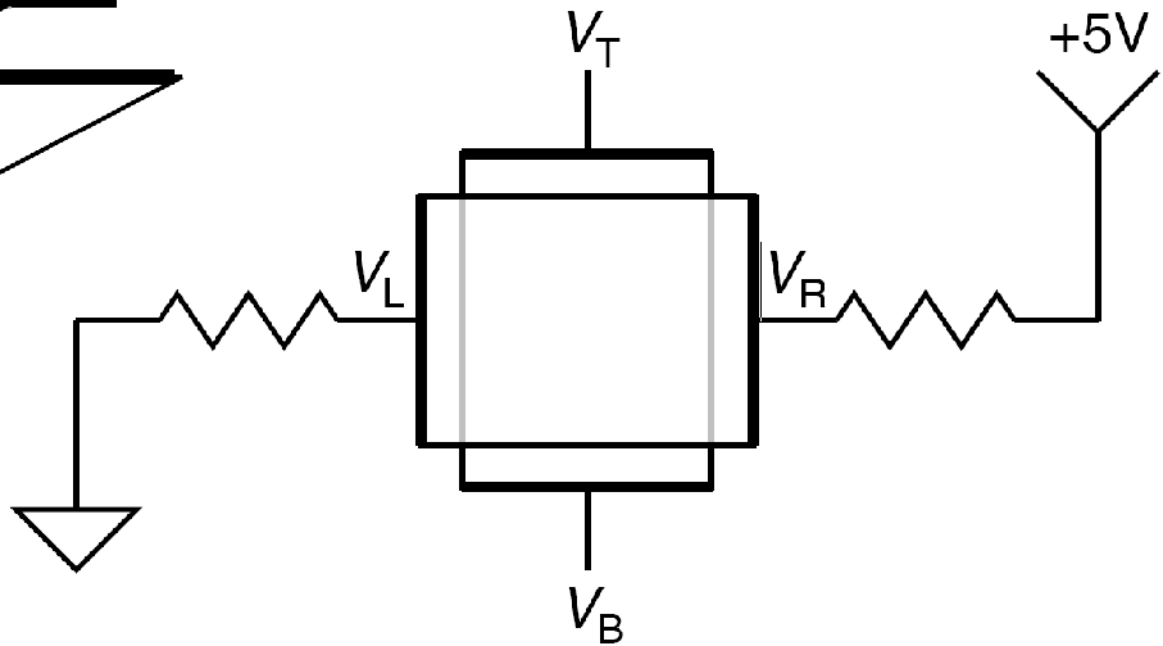
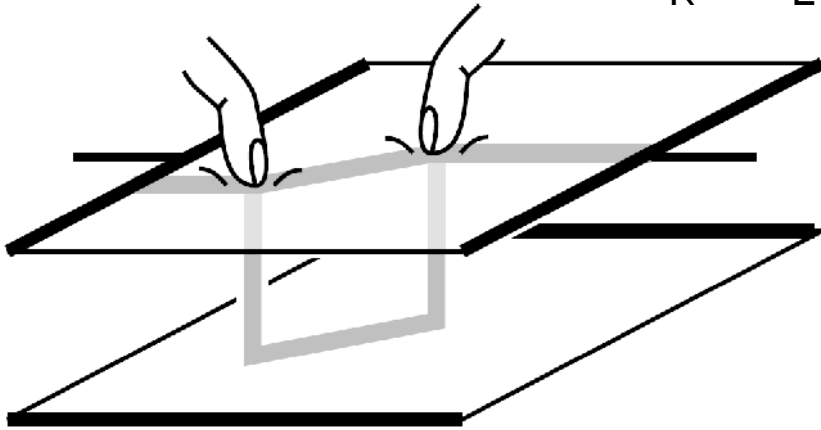


- Arduino controller
- USB to PC (serial port)



Measurement of Extent

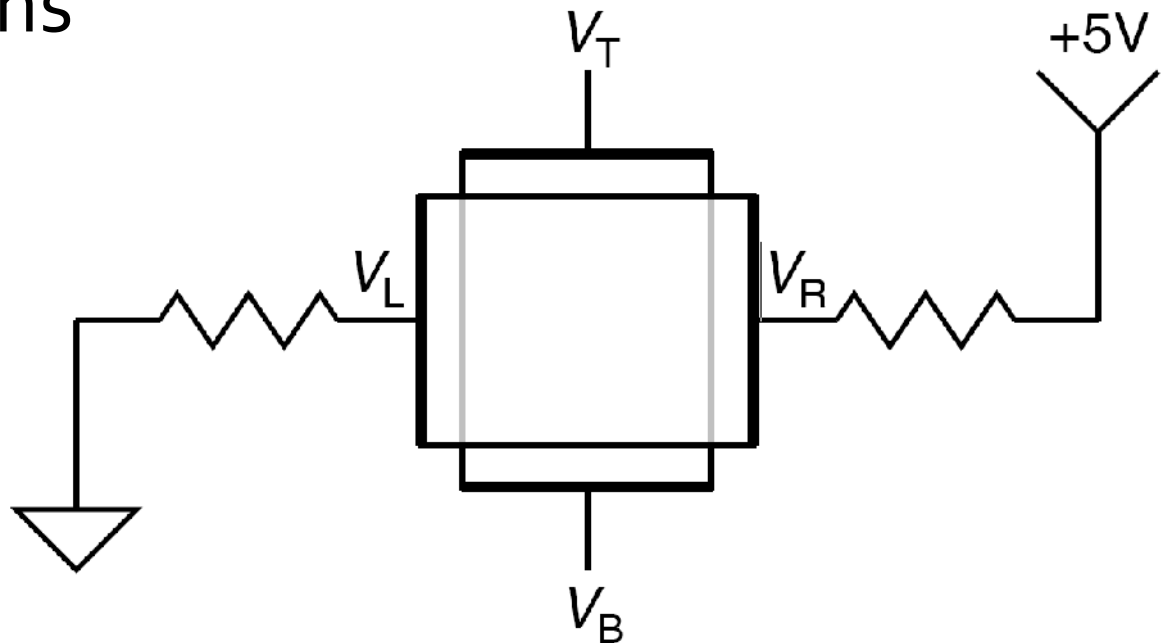
- Simultaneous or extended touches reduce the resistance across the panel
- Measure the change in voltage across the panel ($V_R - V_L$). Resistors needed!



- Single/multiple touch disambig.
- Similarly for y

Measurement of Position

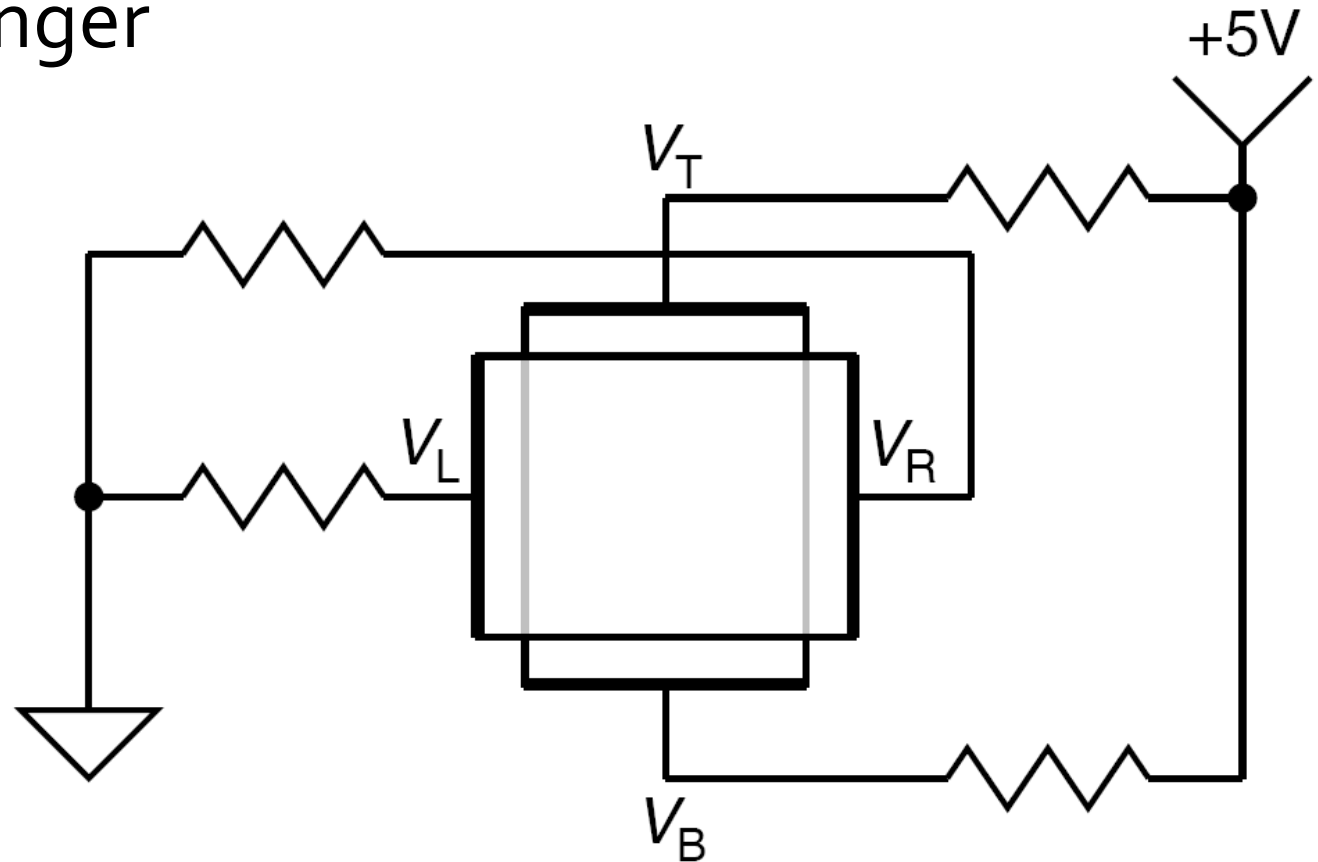
- Similar to standard operation of a four-wire touch panel (but reference to $V_R - V_L$)
- Apply a voltage across and measure the voltage drop at the remaining wires
- For several simultaneous touches: average of positions



- Similarly for y

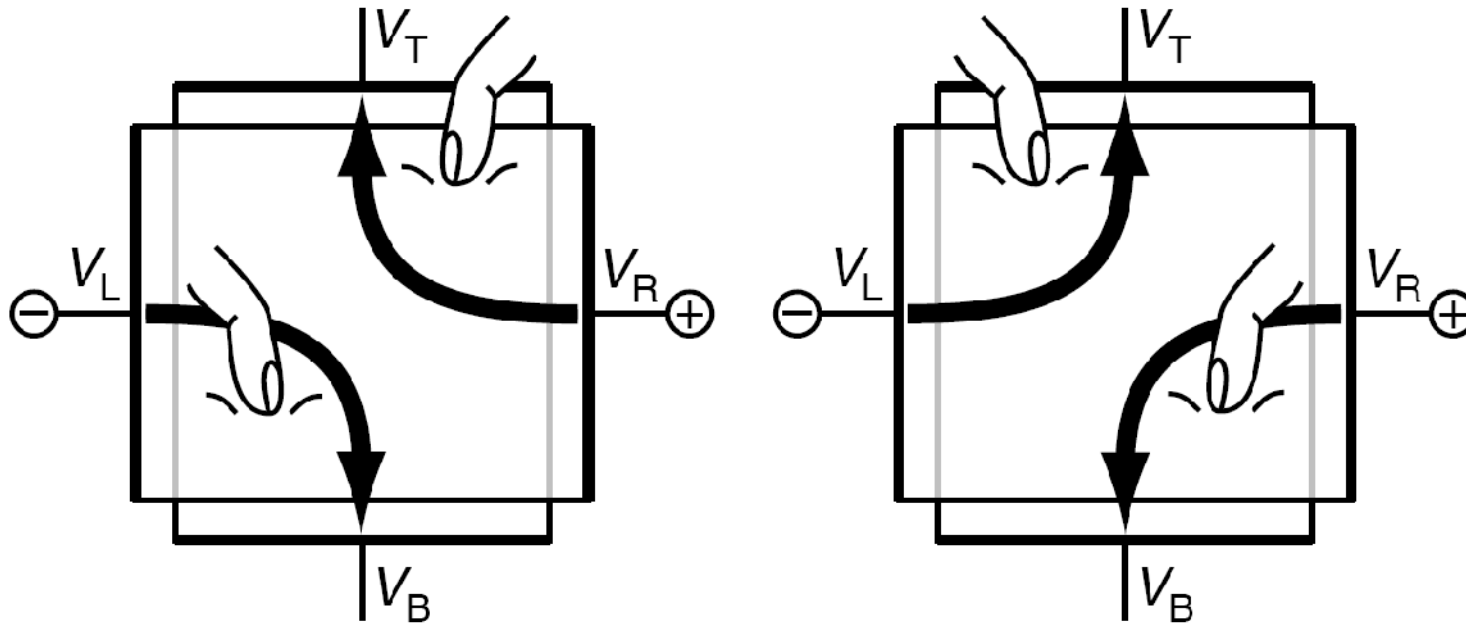
Measurement of Pressure

- Pressure reduces inter-layer contact resistance
- Also needed to detect presence of finger



Angle Disambiguation

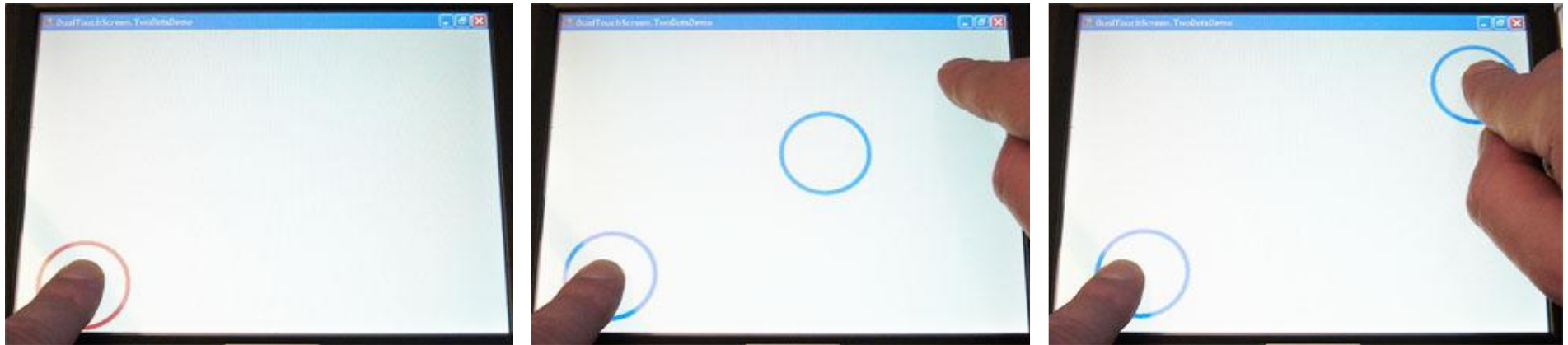
- The x and y extents do not differentiate between:



- Look at $V_T - V_B$ with a voltage applied across

Options and Limitations

- No precise two locations for small pressure
- Extent increases with pressure



- Voluntary ping-pong by pressure balance?
- Issues for applications:
 - Only minor issue for rotation control
 - Zoom control and selection growth by pressure?

Video

Conclusion

- No projector, no camera:
inexpensive, portable, handheld
- Retrofit to existing touch panels
- Accuracy acceptable
for a range of applications
- Pressure balancing
as new interaction mode