Module 2, Lecture 4

Last time:

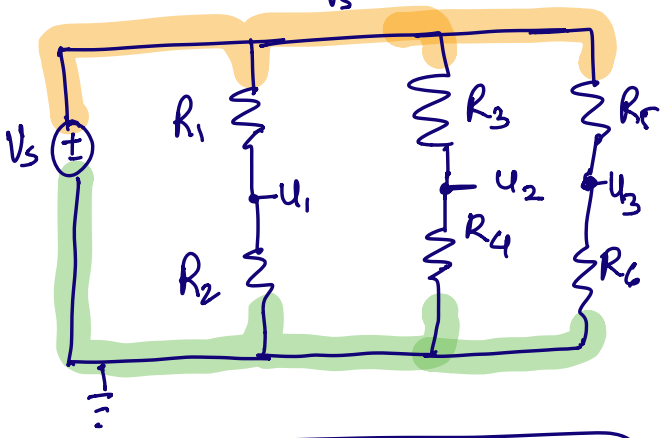
- 1D Touchscreen
- Power

Logistics

- Advising Oct 15.
- How are you doing?
  - Message from your colleges
- Zoom update
- Check video permissions.

Today: • 2D touchscreen
• Equivalence

An interesting circuit



$$U_1 = \frac{R_2}{R_1 + R_2} \cdot V_S$$

$$U_2 = \frac{R_4}{R_3 + R_4} \cdot V_S$$

$$U_3 = \frac{R_6}{R_5 + R_6} \cdot V_S$$

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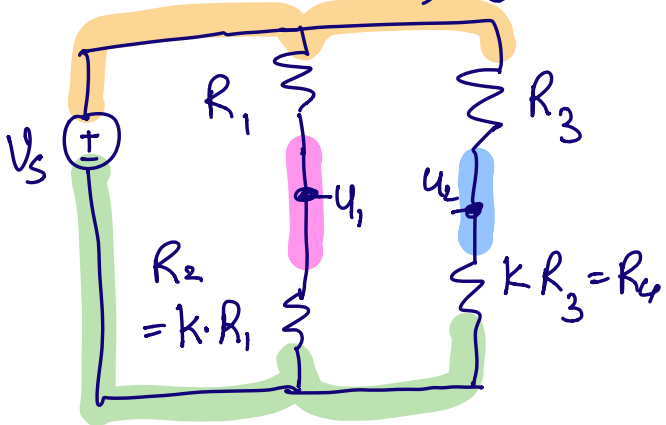
k is a scalar, e.g. $k = 2$



$$U_1 = \frac{kR_1}{R_1 + kR_1} \cdot V_S$$

$$= \frac{k}{1+k} \cdot V_S$$

Ratio of the resistors is $\underline{k}$

$$U_2 = \frac{kR_3 \cdot V_S}{R_3 + kR_3} = \frac{k}{1+k} \cdot V_S$$

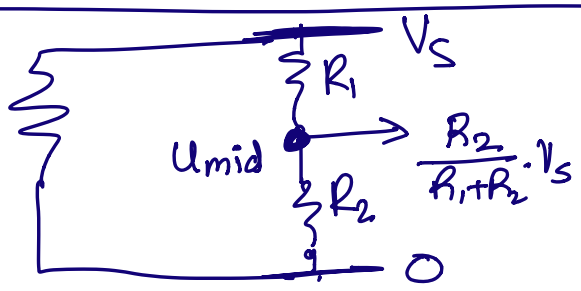
$R_1 = R_1$
$R_2 = k \cdot R_1$
} Ratio between R_1 and R_2 is k

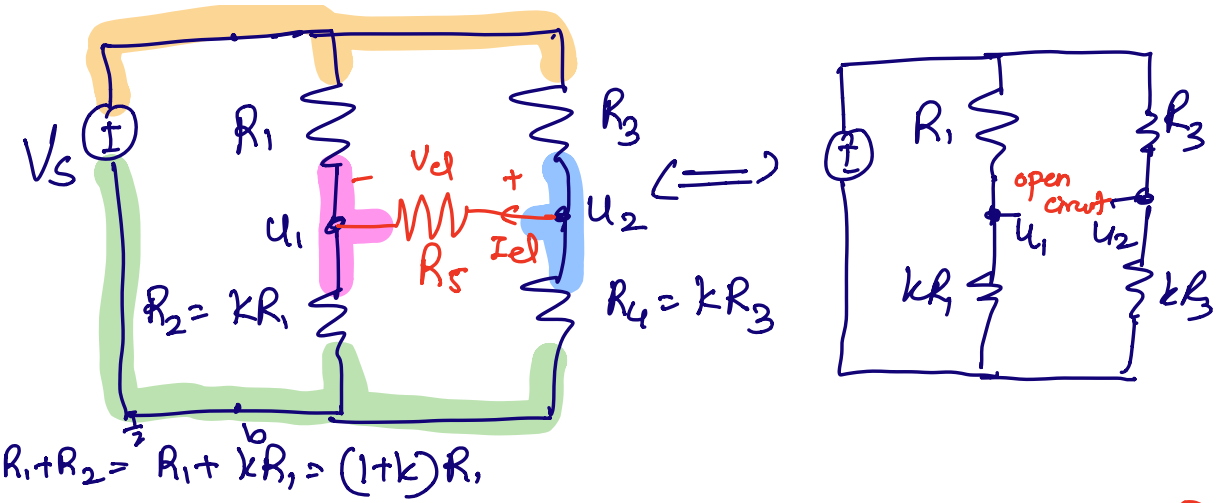
Turns out: $U_1 = U_2$ if $R_1 : R_2 = R_3 : R_4$.

If $U_1 = U_2$

If there is no voltage drop across a resistor, then there is no current flowing through it!

$$U_1 = \frac{R_2}{R_1+R_2} \cdot V_S = \frac{kR_1}{(1+k)R_1} \cdot V_S = \frac{k}{1+k} V_S$$





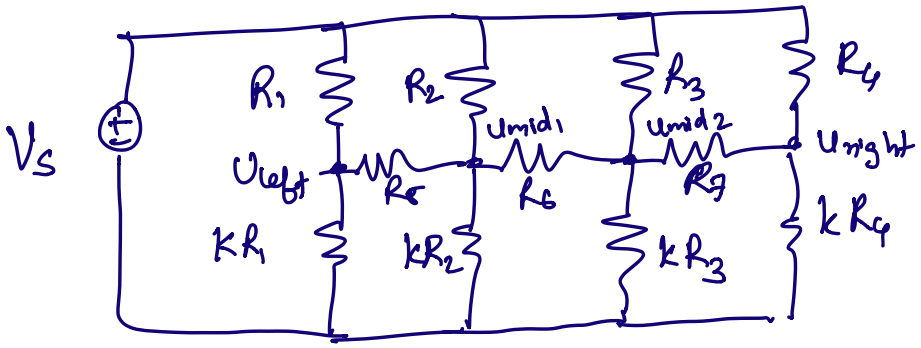
$R_1 + R_2 = R_1 + kR_1 = (1+k)R_1$

Question: What is the current through R_5?

Answer: There is no current.

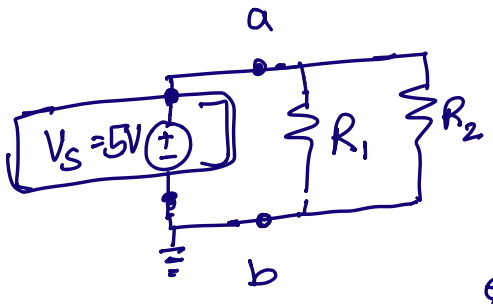
Another way: Node Voltage Analysis.

Building on this: $U_{left} = U_{mid_1} = U_{mid_2} = U_{right}$



R_5, R_6, R_7 will have no current flowing through.

Grid of Resistors: Good model for a "resistive sheet"

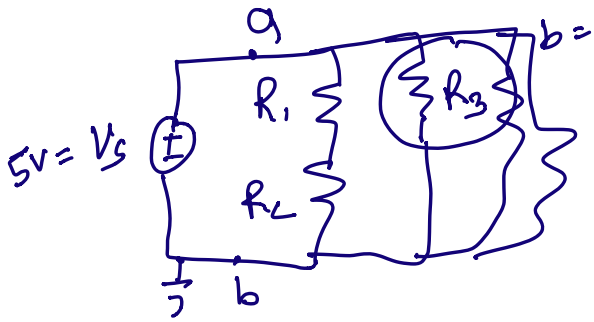


Diff between (a-b)

$b = 0$, $\Rightarrow$ $a = 5V$

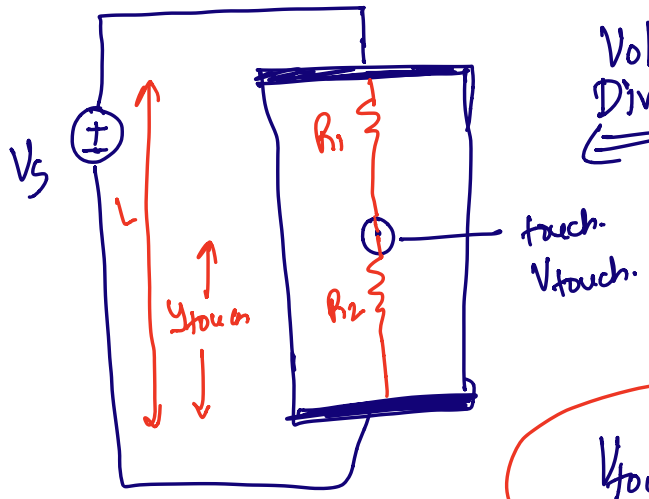
Even with R_3, diff between

$a - b = 5V$.

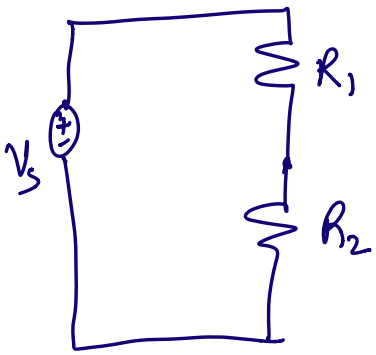


$a = 5V$.

1D Touchscreen

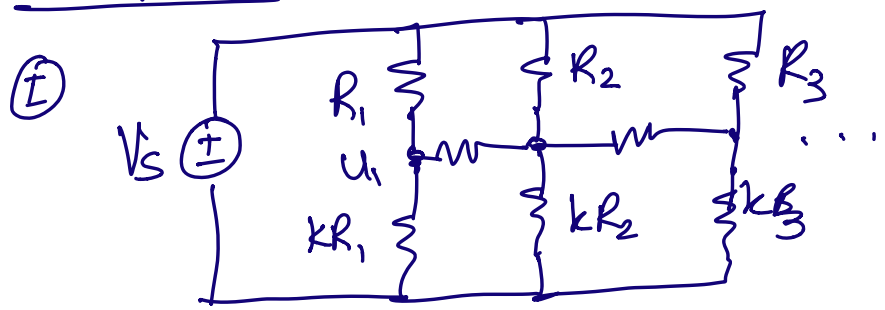


Voltage Divider



$$V_{touch} = \frac{y_{touch} \cdot V_S}{L}$$

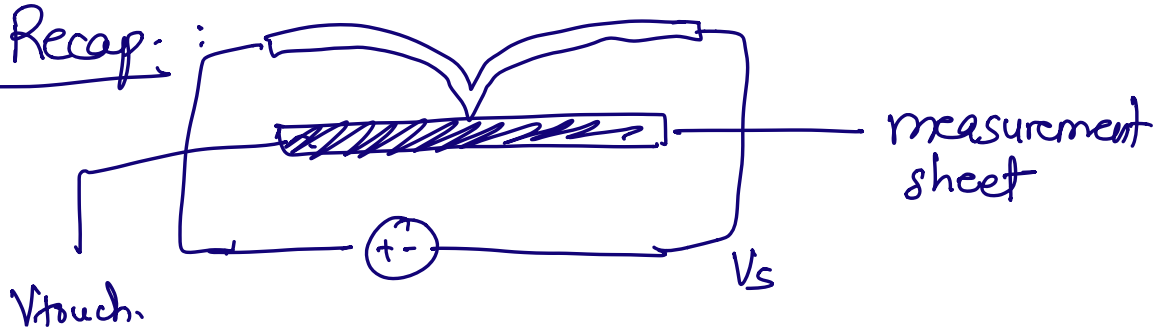
Another model: Grid-based model.



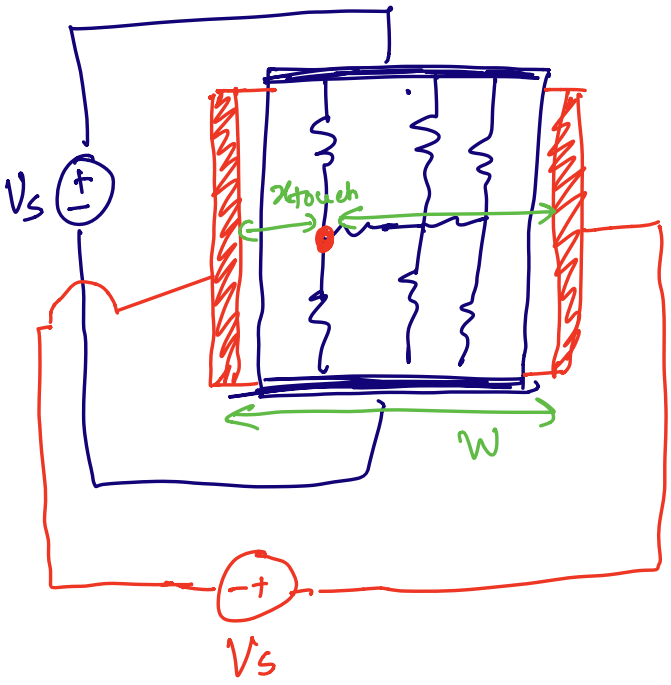
Vertical position ✓

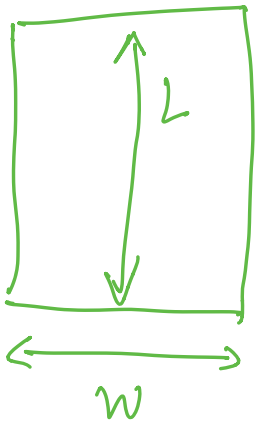
Horizontal position ?

Recap:

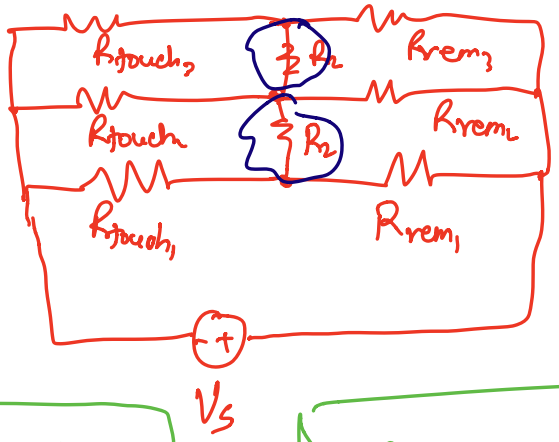


2D touch screen: Consider:





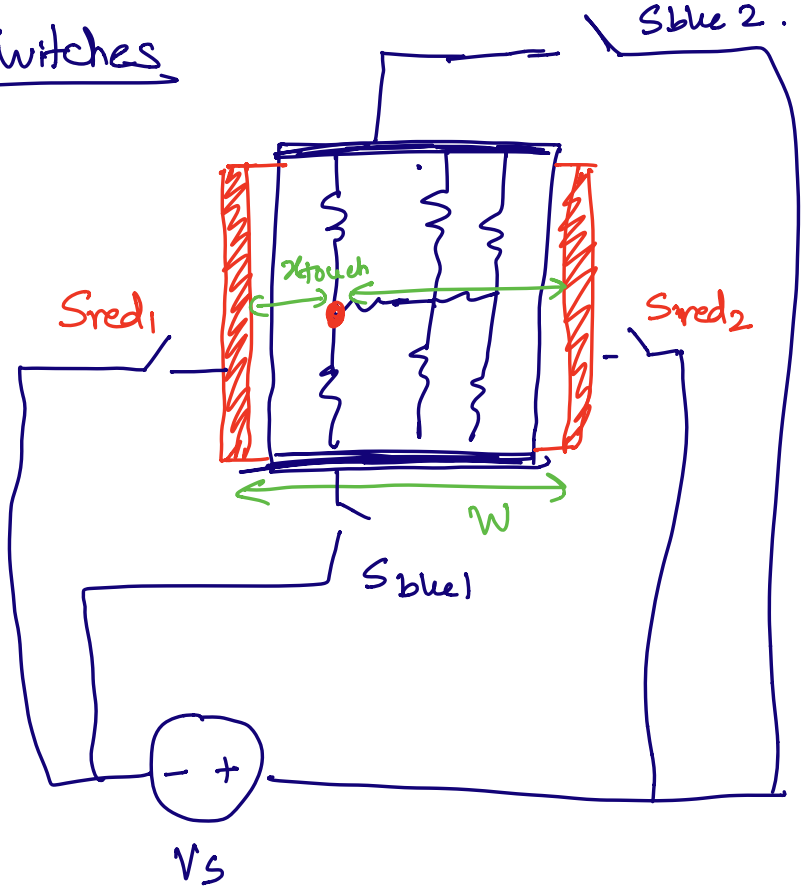
$$R = \frac{\rho \cdot \text{length}}{\text{width} \times \text{thickness}}$$



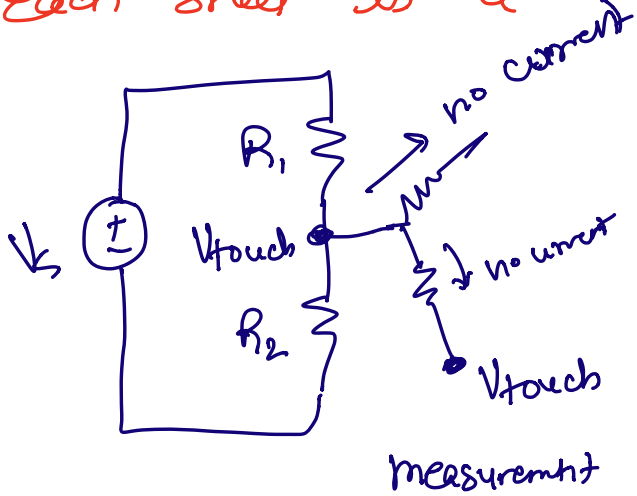
$$R_{touch_1} = \rho \cdot \frac{x_{touch}}{L \cdot h}$$

$$R_{rem_1} = \frac{\rho \cdot (W - x_{touch})}{L \cdot h}$$

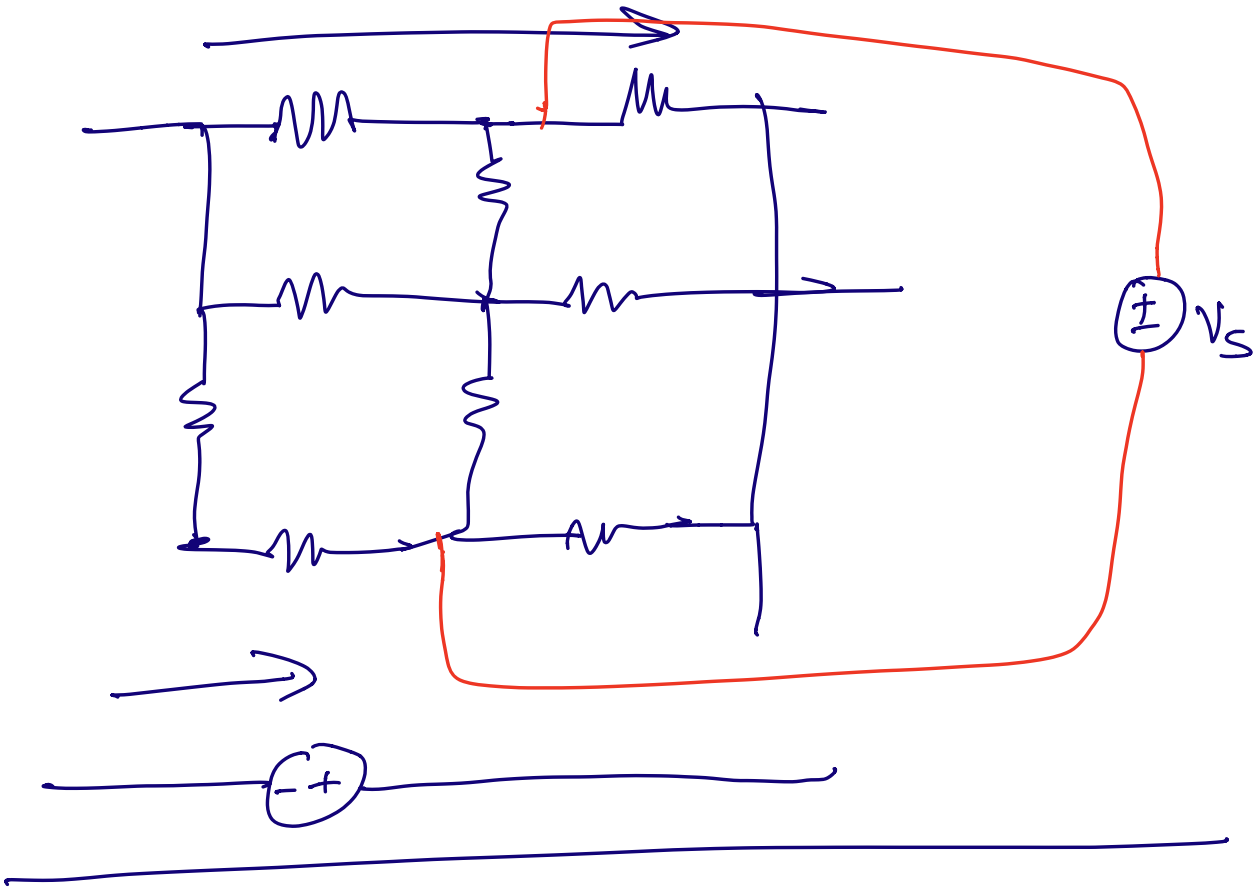
Switches



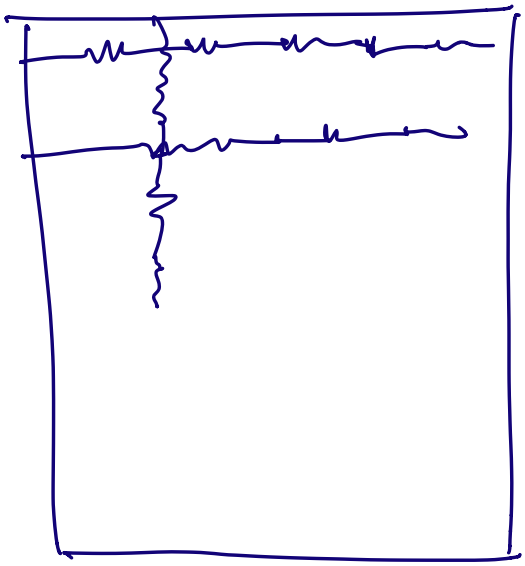
Each sheet is a measurement ~~for the~~ sheet for the other sheets



measurement



Take aways.



Office hours-