



# Visual Logic

## A Graphical System For Logical Reasoning Using Existential Graphs

Shail Patel, Bram van Heuveln



### Formal Logic

- Formal Logic is an effective tool for reasoning
- Used in many fields such as Computer Science, Philosophy, Mathematics
- Abstract, has a tough learning curve, and difficult to interpret

#### Formal Logic Expressions:

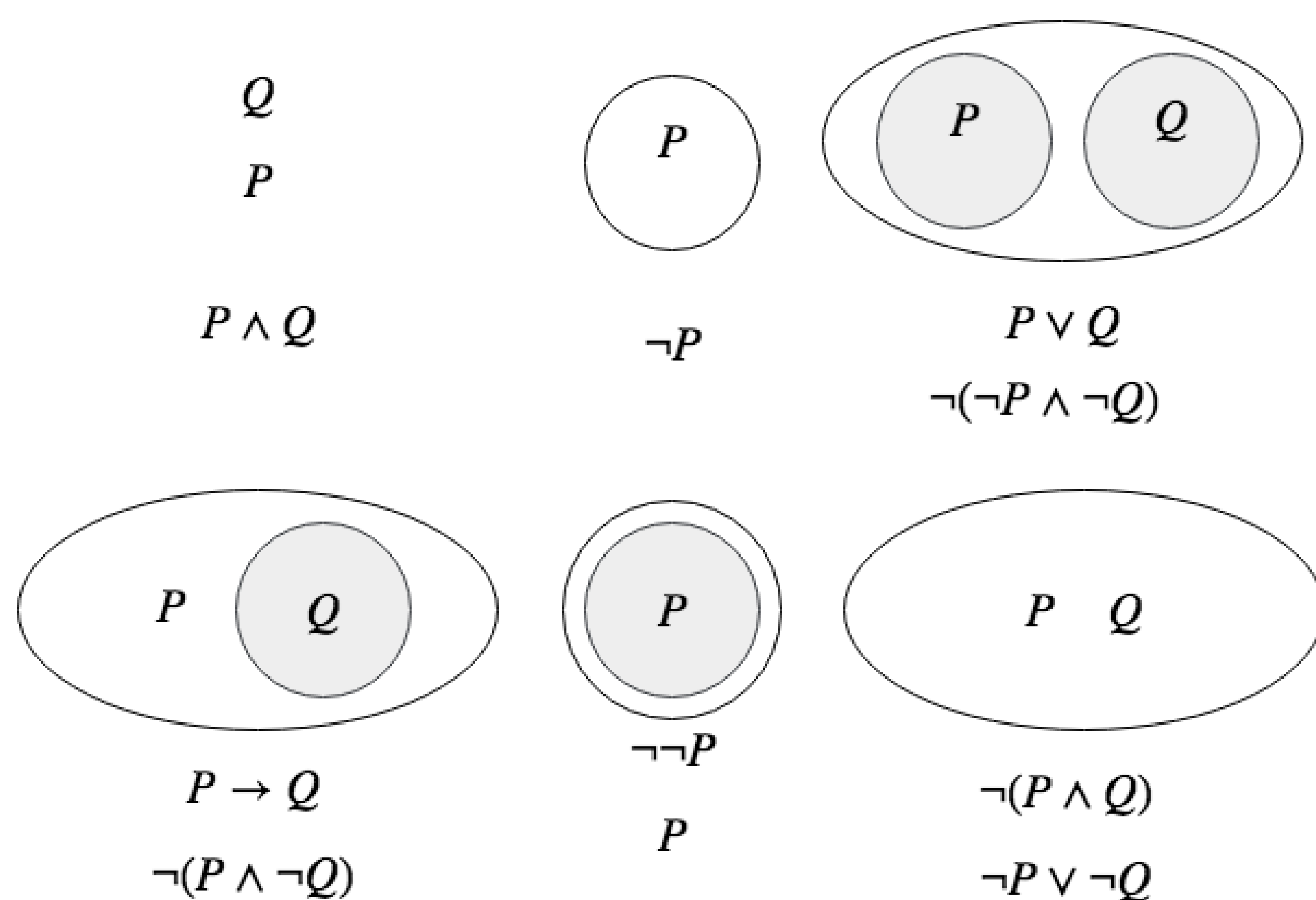
$\neg P$	P does not exist (or is false)
$P$	P exists (or is true)
$P \wedge Q$	P and Q exists
$P \vee Q$	P or (and) Q
$P \rightarrow Q$	If P, then Q exists
$P \leftrightarrow Q$	P exists if and only if Q

...and many more!

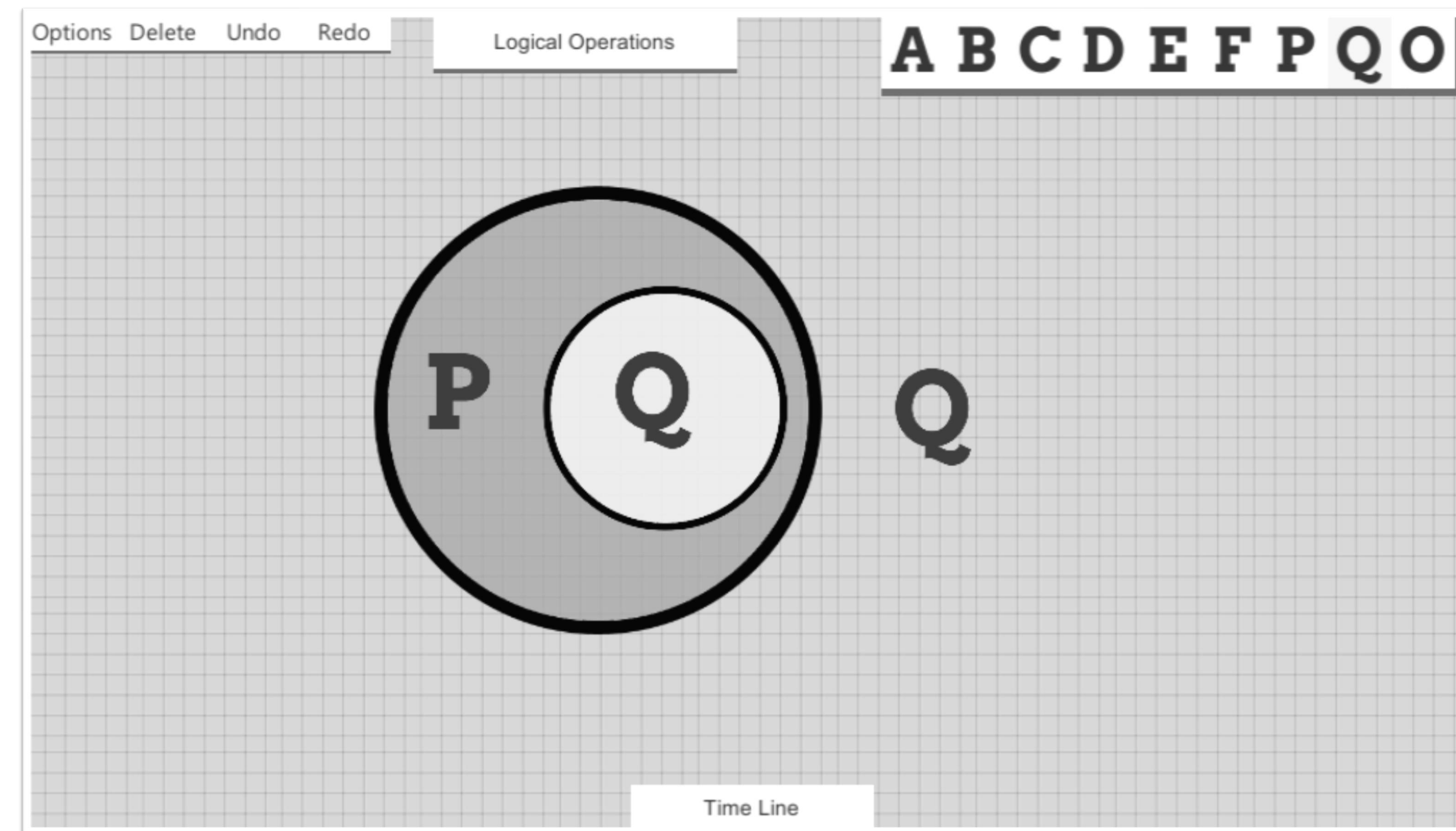
- Many operations combined with unintuitive steps leads to difficulty creating even simple proofs for beginners

### Existential Graphs

- Developed by Charles Sanders Peirce as a more completely graphical system
- Expressively complete and sound with only two symbols and 4 rules
- All proofs are done by transforming and manipulating graphs

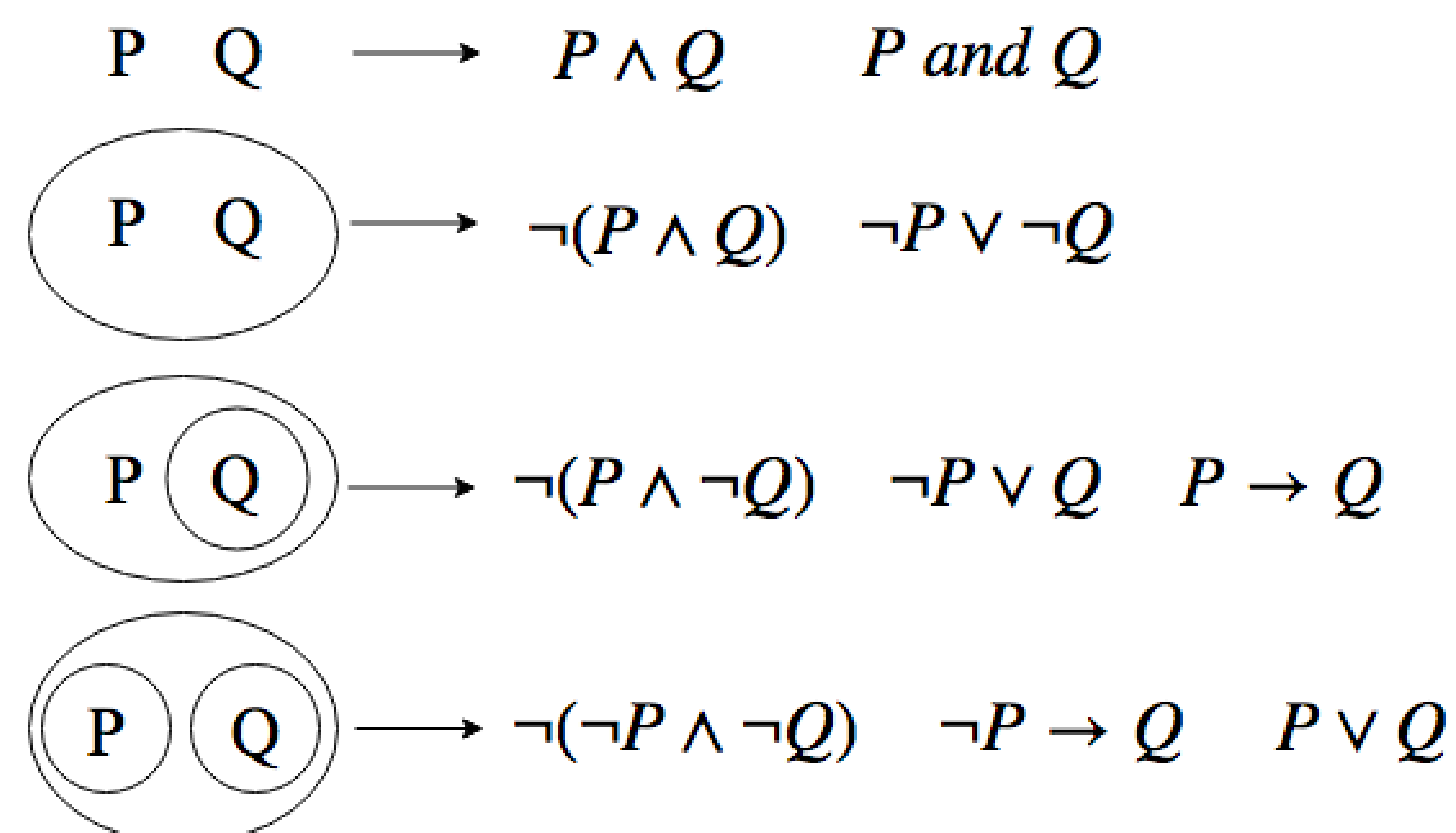


### Interface & Features



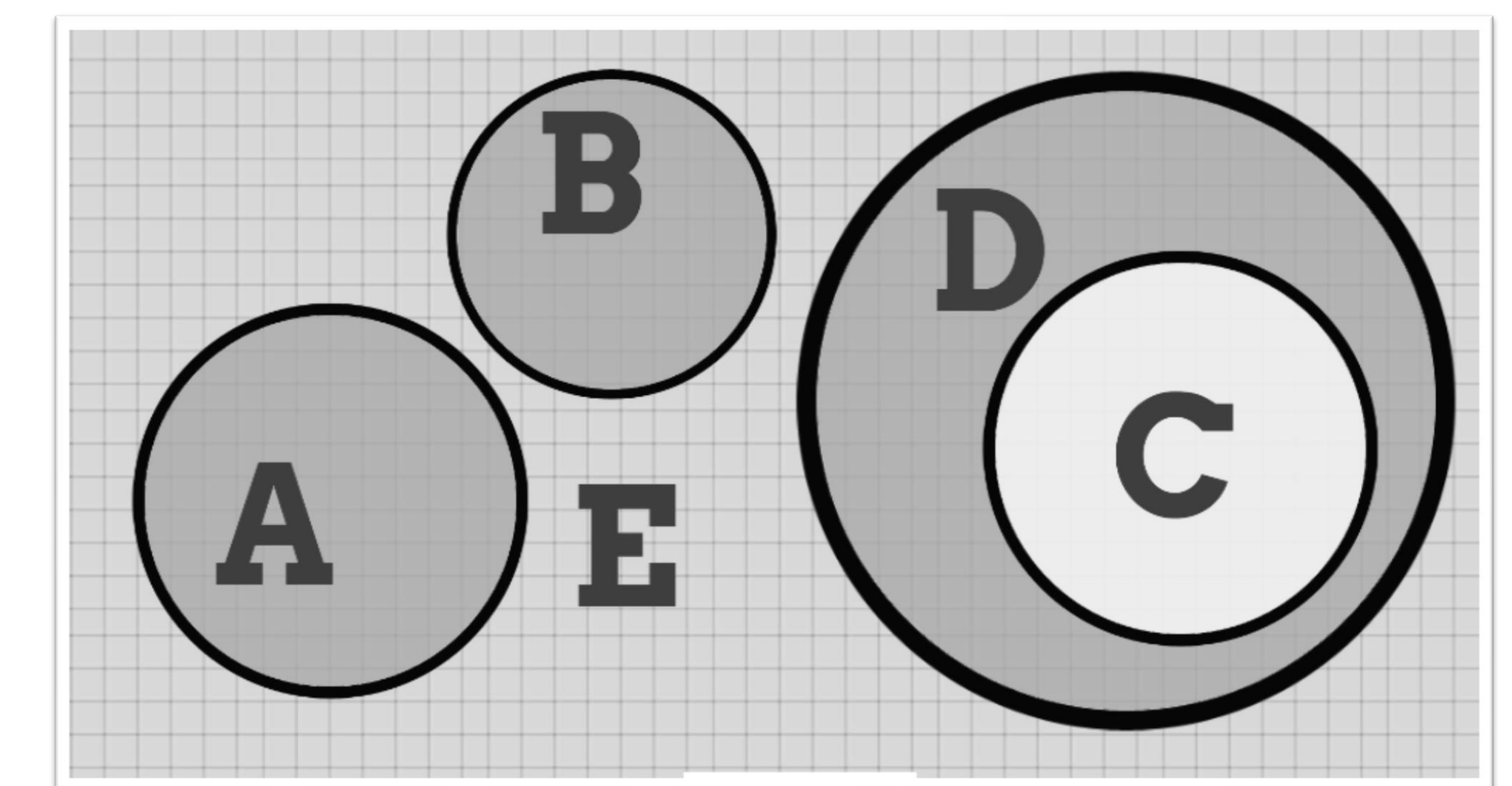
- Workspace where cuts and symbols can be manipulated freely
- Manipulate graphs to create proofs, no need to rewrite statements
- No sub-proofs needed!
- Expression and logical completeness
- Create proofs just like in traditional formal logic

Existential Graphs represent multiple statements at once:



### Advantages

- Express more information with less symbols
- Proofs often require less steps and have fewer rules
- More engaging process
- Less rules of inferences to learn
- Sandbox to experiment and learn logic



### Future Work

- Displaying proofs as "movies"
- Automated theorem proving
- Timeline of steps taken
- Empirical data on using existential graphs vs traditional logic
- Higher levels of logic, first order, modal...

### Demo & Other information

Online Version available at:

[http://shailpatels.me/vl\\_web/vlDemo.html](http://shailpatels.me/vl_web/vlDemo.html)

GitHub:

<https://github.com/shailpatels/VisualLogic>

Professor van Heuveln's research:

<http://www.cogsci.rpi.edu/~heuveln/Research/EG/index.html>

Contact Me!

[patels17@rpi.edu](mailto:patels17@rpi.edu)

