Interaction Example 1

- Processes $(p \to a \to P)$ and $(q \to a \to Q)$ interact
- Intuitively  interact

- We write

$$(p \to a \to P) \parallel (q \to a \to Q)$$

The 4 brackets are necessary, to avoid ambiguity

Interaction Example 1 (*Continued*)

$$(p \to a \to P) \parallel (q \to a \to Q)$$

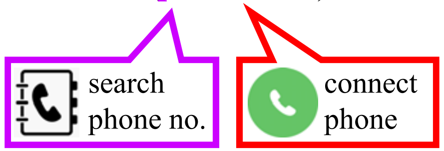
Must specify the characteristic of each event:

- ***a*** is a ***common*** event relevant to P and Q
  - Hence, in αP and αQ
- ***p*** is an ***internal*** event relevant only to P but not Q
  - Hence, in αP but not αQ
- ***q*** is an ***internal*** event relevant only to Q but not P
  - Hence, in αQ but not αP
- Only the ***common*** event ***a*** is synchronized

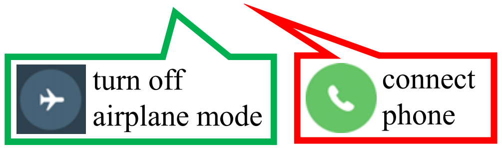
Interaction Example 1 (Continued)

Real Life Application

$$(p \to a \to P)$$



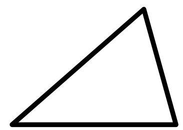
$$(q \to a \to Q)$$



Need for Formal Axioms and Proofs in Real Life

Example 1

- Sum of 3 angles in a triangle = ***??***



- ***How to prove ??*** ...

Need for Formal Axioms and Proofs in Real Life

Example 1 (*Continued*)

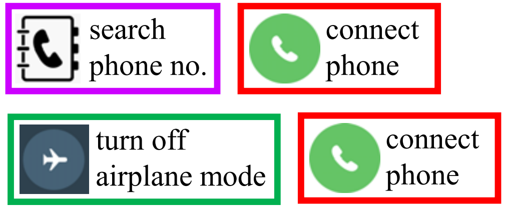
Interesting IQ Question

- A tourist sees a huge bear
- They drop the LV suitcase
- Runs 100 m South
- Runs 100 m East
- Runs 100 m North
- Finds that they return to the location of the suiitcase
- What is the colour of the bear ***??*** .

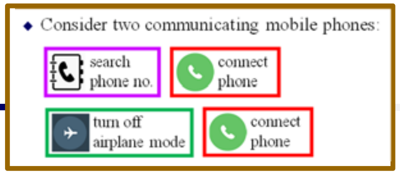
Need for Formal Axioms and Proofs in Real Life

Example 2

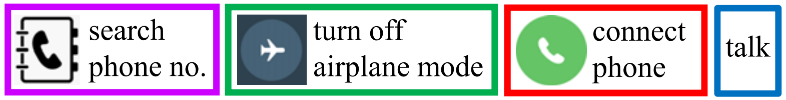
- Consider two communicating mobile phones:



Example 2 (*Continued*)



- We expect ***either***



or

- But ***how*** do we know ***??*** .

Laws

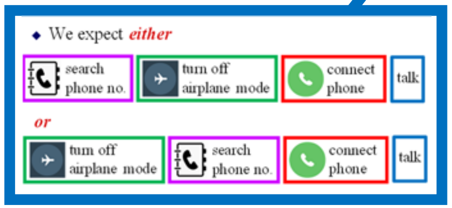
- Minimum set of ***axioms*** that are assumed to be true, to serve as starting point for formal reasoning
- All other system behaviour can then be ***proved*** ...

Formal Reasoning Based on the Laws

- For instance, we can then ***prove*** that

$$(p \rightarrow a \rightarrow P) \;||\; (q \rightarrow a \rightarrow Q)$$

$$= \big(p \rightarrow q \rightarrow a \rightarrow (P \,||\, Q) \;\big|\; q \rightarrow p \rightarrow a \rightarrow (P \,||\, Q) \big)$$



But intuition is unreliable .