

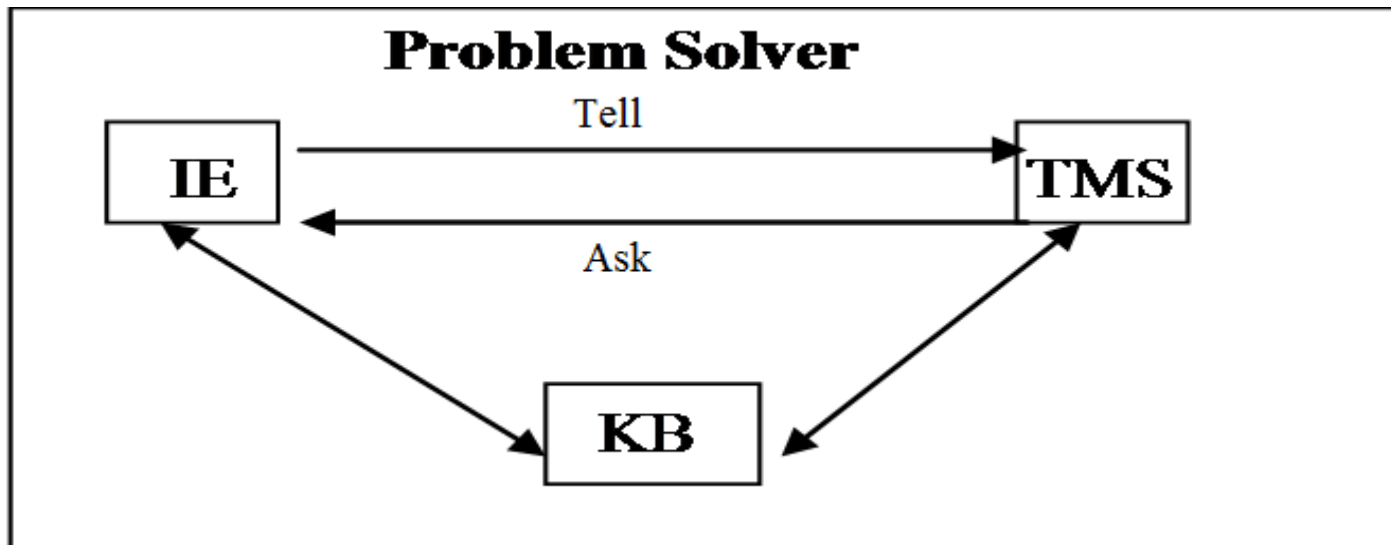
Truth Maintenance System

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Truth Maintenance System (TMS)

- Definition of TMS:
- Truth maintenance system (TMS) works with inference engines for solving problems within large search spaces.
- The TMS and inference engine both put together can solve problems where algorithmic solutions do not exist.
- TMS maintains the beliefs for general problem solving systems.
- IE – Inference Engine
- KB – Knowledge Base



TMS – Cont ...

- TMS can be used to implement monotonic or non-monotonic systems.
- In monotonic system, once a fact or piece of knowledge is stored in KB, it can **not change**.
 - In monotonic reasoning, the world of axioms continually increases in size and keeps on expanding.
 - Predicate logic is an example of monotonic form of reasoning. It is a deductive reasoning system where new facts are derived from the known facts.
- Non-monotonic system allows **retraction** of truths that are present in the system whenever contradictions arise.
 - So number of axioms can both increase and decrease and depending upon the changes in KB, it can be updated.

Monotonic TMS

Monotonic Reasoning

- Once the conclusion is taken, then it will remain same even if we add some other information to existing information in our knowledge base.
- Decision are not affected by new facts, not suitable for real time system.
- Example:
 - 1) Earth revolves around sun
 - 2) Earth is not Round---new information

Monotonic TMS

Monotonic Reasoning

- All old proofs are valid I
- Can't use for real world problem
- New knowledge from real world can't be added
- Example: Theorem Proving

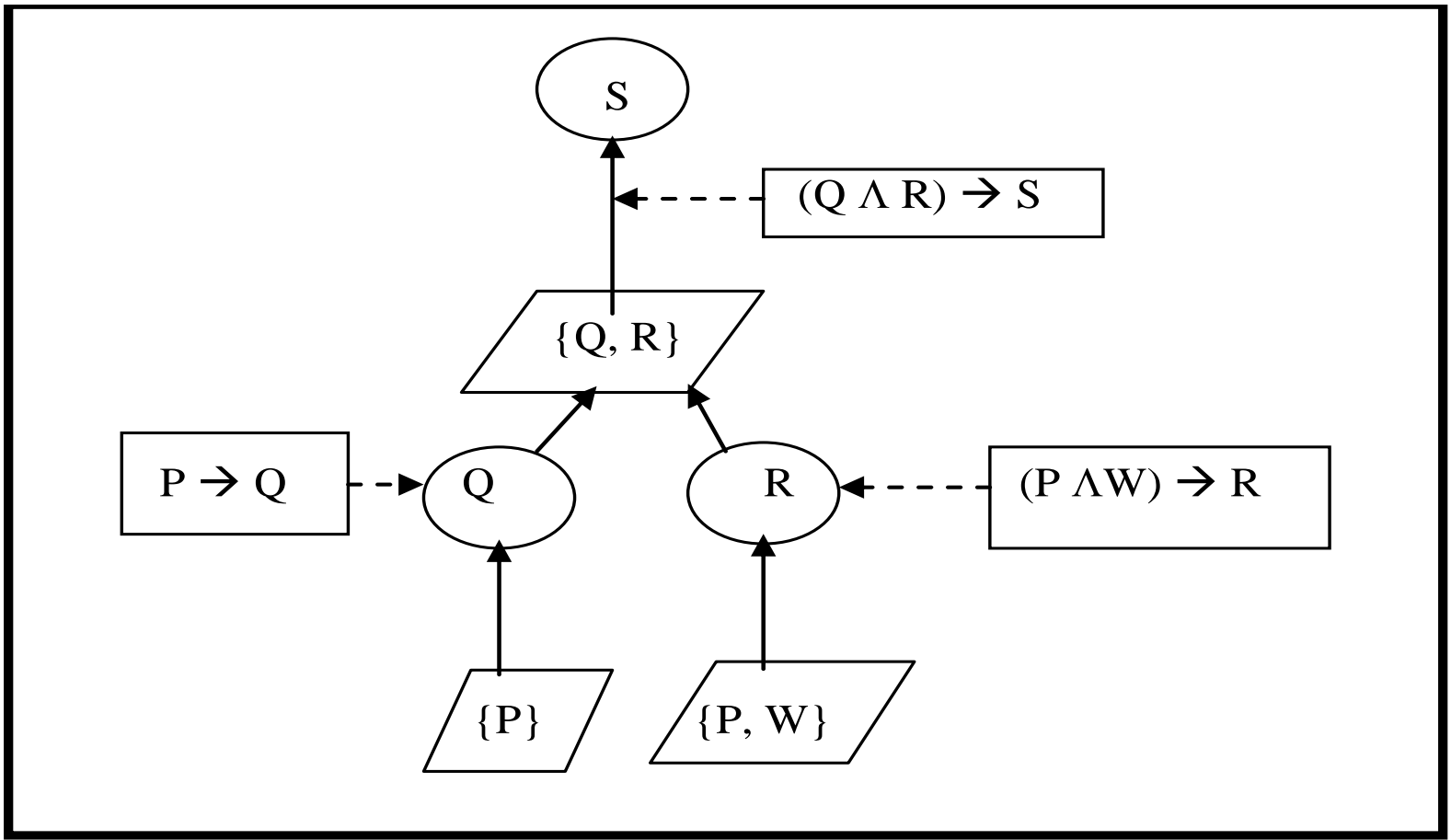
Example – Monotonic TMS

- Suppose we are given the premise set $\Sigma = \{P, W\}$ and the internal constraint set

$$\{P \rightarrow Q, (P \wedge W) \rightarrow R, (Q \wedge R) \rightarrow S\}.$$

- TMS are able to derive S from these constraints and the premise set Σ .
- TMS should provide the justifications of deriving S from constraints and premises.
- Therefore, for any given set of internal constraints and premise set Σ , if a formula S can be derived from these, then justification functions generate a justification tree for S .

Justification Tree



Non Monotonic TMS

Non Monotonic Reasoning

- Conclusion may be invalidated if we add some more information to our knowledge base.
- Helpful in real world scenario.

Example:

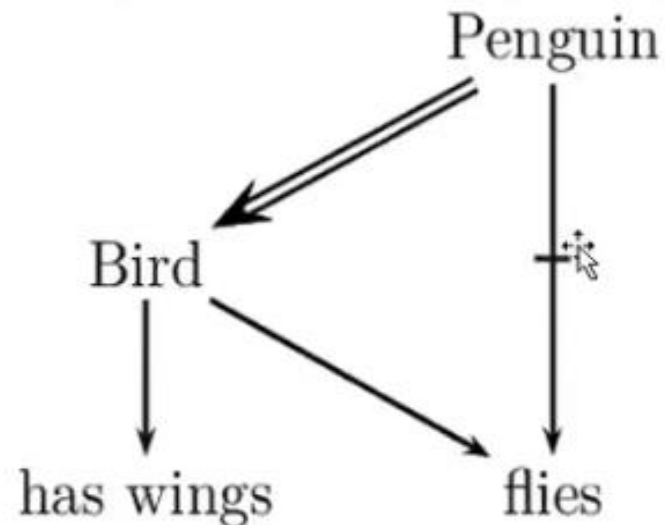
- Facts:
 - Birds can fly.
 - Penguins can't fly.
 - Alex is bird
- Conclusion: Alex can Fly

Non Monotonic TMS

Non Monotonic Reasoning

Example:

- Penguin cannot fly
- Birds has wings
- Birds can fly
- Penguin is a bird
- Conclusion: Penguin can fly



• **THE END**