

MATH2301 - Assignment 1

PART 2

The PERT (Program Evaluation and Review Technique) method works by breaking down a project into its tasks and describing how they relate to each other in various diagrams and tables and such. It is designed to estimate how long a project should take to complete and which steps are the most important. The project is represented by a set of related required activities. PERT is a statistical mathematical method of project planning to ensure efficiency. A PERT chart is constructed. The first task starts with the initiation node. If multiple tasks start at the same time they all start from the same node and branch out from the starting point. Each task in the whole process is represented by a line, which has the task name or other details attached. At the end of the line is another node signifying the beginning of another task or "slack time" the waiting time between tasks. In the PERT chart, each task is connected to the one before it forming a network of nodes and interconnecting lines. The chart is complete when all of the lines come together at the completion node. The relationships between the tasks create pathways through the project process. The longest pathway is the critical pathway.

Critical path method (CPM) charts are similar to PERT charts. In a CPM chart the critical path is indicated. This is the set of dependent tasks that takes the longest time to complete. A CPM chart can have multiple equally critical paths although this is not normally done.

PERT and CPM belong with Graph Theory. A Graph is a set of nodes connected by edges where something flows along the edges. This is obviously related to PERT/CPM. In a PERT chart the individual tasks of the project are represented by the edges in the graphs. The nodes in the graph represent the "states" in the project. The dependence of one state upon another is represented by the edge (task) connecting the two nodes. The tasks describe how two activities are related to each other, this is a relation in the set of all tasks. The edges are directional edges where

$a \rightarrow b$ and $b \rightarrow a$. A is required to be complete before task b can begin.

Such as the walls being built before the roof is on a house. The completed wall is a state preceding the task of building the roof. One needs to be completed before the other. The set of all tasks in a PERT chart is a partially ordered set because it is anti-symmetric and transitive.

Anti-symmetric: If $a \rightarrow b$ and $b \rightarrow a$ then $a = b$.

if aRb then b is never related to a so it

is antisymmetric.

Transitive R is transitive if aRb and bRc then aRc for $a, b, c \in S$. If aRb then $a < b$. If bRc then $b < c$. $a < b < c, a < c$ therefore aRc .

A PERT chart is basically a Hasse diagram.

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