

ABSTRACT

An important preliminary step to layouts design is the closeness relationship diagrams development. Thus far, there has been no methodology to confirm the optimality of the diagrams, which, in turn, affects the construction of optimal layouts. This research proposes algorithm for developing the optimal closeness relationship diagrams. The seven-step process of the algorithm includes accepting closeness ratings as inputs, converting them into numerical proximity values, sorting closeness relationships by importance, confirming feasibility of the relationship diagram by performing the UP (U-Check and P-Index) Test, optimizing all inter-node proximities, identifying Cartesian coordinates of nodes, and finally drawing the optimal closeness relationship diagram. The heart of the optimal closeness relationship diagramming algorithm is the UP Test. It serves as the optimality indicator. Mathematical manipulation of the resulting optimal closeness ratings is accomplished to pinpoint spatial allocation of the nodes in planar Cartesian coordinates. Results confirm that all 216 three-node closeness relationship diagrams and 462 four-node closeness relationship diagrams developed based on the algorithm are optimal. The primary strength of the algorithm lies in its ability to guarantee optimal three-node and four-node closeness relationship diagrams. The seven-step algorithm is also systematic and lends itself nicely to computerization. Future research is planned to formulate an optimal closeness relationship diagramming algorithm for any number of nodes. Eventually, the computerized layout planning system based on this optimal closeness relationship diagramming algorithm may be developed. This helps enhance the quality of the obtained layouts and serves as technological contributions to the area of facility planning and design.