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Assignment 9
(Due: 23.01.2023)

Task 1 Visual Analytics

(a) Visual Analytics aims to enable effective exploration and analysis of data by visual representation of models generated by data mining. It differs from Information Visualization in the sense that Information Visualization only deals with the representation of data and not the interactive exploration and analysis of data. Visual Analytics allows collaboration of multiple users to share insights and generate knowledge. Apart from this, in Visual Analytics is also scalable to visualize large, complex and real-time data sets.

(b) Following are the main components of the visual analytics pipeline by Keim et al. -

1. Data acquisition and transformation: This step deals with collecting, cleaning and transforming raw data into a format suitable for visual analysis. This refers to the 'automatic storage element' which holds work pieces in iTRAME system.
2. Data Reduction and Exploration: In this step, data is reduced to a manageable size by sampling, filtering and aggregation. Visual Data Mining then enables exploration of data by identifying patterns, trends and outliers in the data which has been dimensionally reduced
3. Data Analysis and Visualization: This step deals with analysis of data by using visual representations like bar charts and graph for data modelling. This refers to the 'vision station' which can visually inspect a work piece using a camera .
4. Data Interpretation, Communication and Knowledge Generation: The visual representation helps in generating key insights and decision making process and communicate it further through visual reports. This corresponds with the 'manual labor station' in iTRAME system which presents work pieces to humans.
These steps are not linear. In the same manner, the segments of iTRAME system are modular and bidirectional. Applying visual analytics on simulation-based visual layout helps in better designing of physical spaces and to quickly test and iterate different layout options.

(c) A visual analytic system helps in spatial designing and improving factory's layout by providing interactive tools for analysis and optimization. The current inadequacies in the factory's layout can be easily identified by using visual analytic tools such as heat maps, 3D maps and interactive visualization. The data in the factory which can be easily monitored using visual analytic tools are machine utilization, employee presence and production line flow among others. Visual analytic tools can simulate different layout options which may help designers to select the best option which satisfies highest quality efficiency, production and safety.

Task 2 k-Means Clustering

(a) Impl

(b) When I change k, as k increases, the cluster size decreases. Since the initial centroids of clustering are randomly determined, the quality of clustering differs according to the randomly determined points. Good results are shown when the number of clusters (k) is 3. when I run the algorithm multiple times with the same k, the shape of the cluster changes each time. because the initial centroids is randomly determined.