ICCS200: Assignment 7

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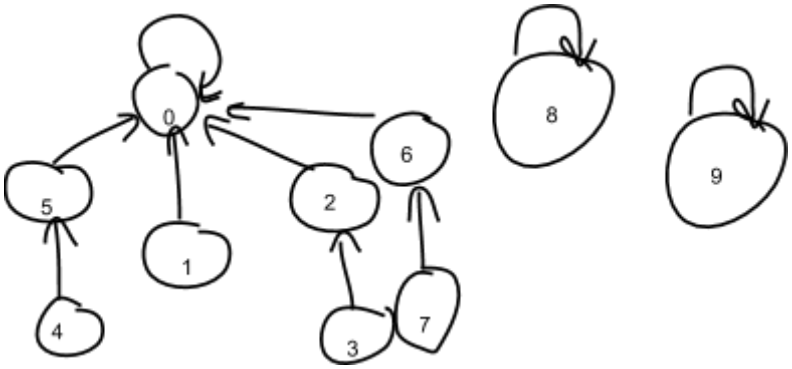
09/07/2019

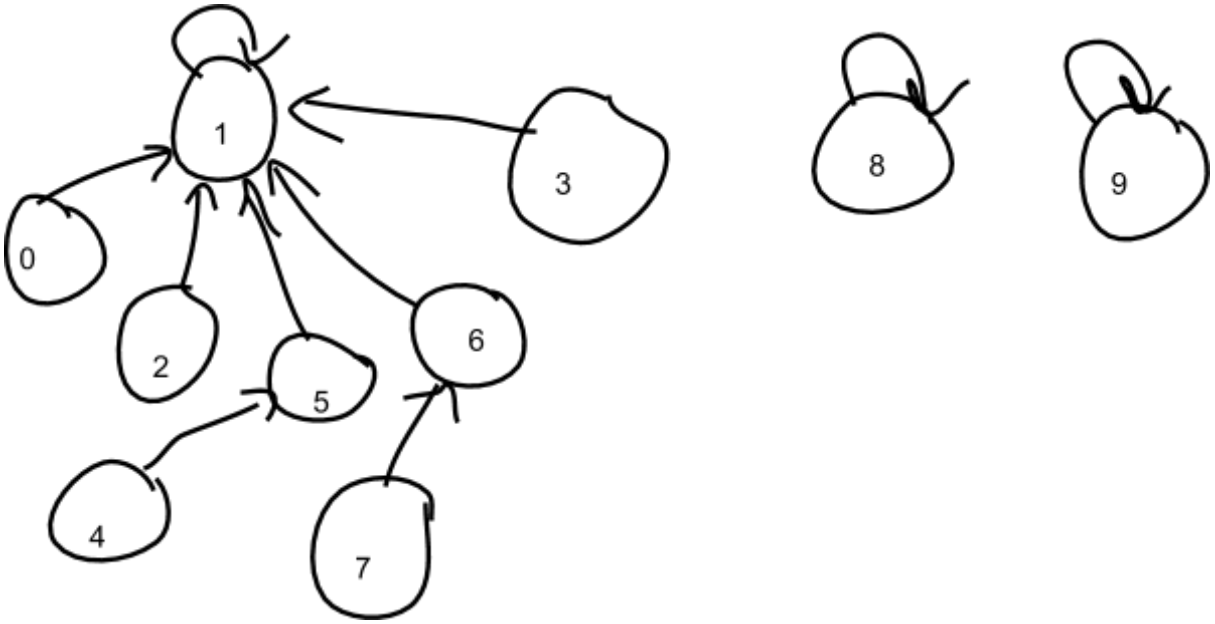
People in 1408 & 1409

Exercise 1:

Union by Size



Path Compression



Exercise 2:
TreeSet

```java
class exercise2 {

  Set<Integer> nbrsExcluding(UndirectedGraph G, Set<Integer> vtxes, Set<Integer> excl) { // O(S+M *log(S))
    Set<Integer> union = new TreeSet<>(); // not HashMap
    for (Integer src : vtxes) { // O(S) -> O(S+M log S)
      for (Integer dst : G.adj(src)) // O(m) -> O(m log S)
        if (!excl.contains(dst)) union.add(dst); // O(log S)
    }
    return union;
  }

  Set<Integer> bfs(UndirectedGraph G, int s) { // O(S+M*log S)
    Set<Integer> frontier = new TreeSet<>(Arrays.asList(s)); // O(1)
    Set<Integer> visited = new TreeSet<>(Arrays.asList(s)); // O(1)
    while (!frontier.isEmpty()) { // O(S log S)
      frontier = nbrsExcluding(G, frontier, visited); // O(S log S)
      visited.addAll(frontier); // O((S+M)*log(S))
    }
    return visited;
  }
}
// bsf Run time is O(S+M log S) while S is the size of the Collection M is the size of Edges
```