Software Maintainability

Part 1: Tool Demonstration

Tool Demonstration

The program used for this demonstration is a grocery list creator written in java [1].

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Additional metrics I added within this report is estimate labor rate analysis based on LOC and complexity. This provided the total count of functions LOC and complexity to find the function averages of Loc and complexity. From this information an analyst can derive an estimation cost projection for labor based on function averages. The file functional summary provides an estimation of maximum LOC within each function and function complexity while maintaining the quality level of the project. This is pertinent for this program if the programmer decides on further developing the program.

Metrics Report and Source Code

```
public class Groceries
  public static void main (String[]args)
   GroceryList list=new GroceryList();
   GroceryItem I1=new GroceryItem ("Oreos", 3, 2.5);
   GroceryItem I2=new GroceryItem ("Goldfish Crackers", 2, 1.75);
   GroceryItem I3=new GroceryItem ("Apple", 8, .23);
   GroceryItem I4=new GroceryItem ("Fruit Loops", 2, 4.32);
   GroceryItem I5=new GroceryItem ("Pop Tarts", 4, 3.67);
   list.add(I1);
   list.add(I2);
   list.add(I3);
   list.add(I4);
   list.add(I5);
   System.out.println("Grocery List");
   System.out.println(list.toString());
   System.out.println(list.getTotalCost());
}
public class GroceryItem
  String name;
  int quantity;
  double price;
                                                                                   }
  public GroceryItem (String name2, int quantity2, double price2)
  {
    name=name2;
                                                                                }
    quantity=quantity2;
    price=price2;
  public double getCost()
    double a=price*quantity;
    return a;
  public void setQuantity(int newquantity)
  {
    quantity=newquantity;
  public String toString()
    return quantity+" "+name.toString()+" @ "+price+" = "+getCost();
}
```

```
import java.util.ArrayList;
public class GroceryList
  ArrayList <GroceryItem> list;
  public GroceryList()
    list=new ArrayList<GroceryItem>();
  public void add(GroceryItem item)
    list.add(item);
  public double getTotalCost()
    double sum=0;
    for(int i=0; i<list.size(); i++)
      sum+= list.get(i).getCost();
    return sum;
  public String toString()
   String s = "";
    for(int i=0; i<list.size(); i++)</pre>
      s+= list.get(i).toString()+"\n";
    return s;
```

Part 2: Software Maintainability Measure

Maintainability Measure Identification

The author describes maintainability as a set of attributes that impact the level of effort necessary to conduct specified modifications [2]. Software maintainability is measured through the readability of the software's source code (RSC), the quality of its documentation (DOQ), and the understandability of software (UOS). These three aspects are significant for understanding an application overall, how the software is revised overtime, and the enhancement of the software [2]. This paper talks about complexity and maintainability measures on lexical levels. These measures include Lines of Code (LOC), total number of lines commented, Halstead length, Halstead volume, Halstead effort, number of blank lines, the number of executable semicolons or statements, the average number of statements between two references that are successive to the same variable, and etc. [2]. Some of these measures are estimated in the nondefault metrics I chose from the first part, estimate labor rate analysis based on LOC and complexity. These maintainability measures are calculated through the construction of formulas. Formulas such that approach maintainability with a function of directly measurable attributes between A_1 and A_n ; this function is written as so $M = \int (A_1, A_2, ..., A_n)$ [2]. Approaching the formula may look simple on the surface, but many difficulties may arise when measuring such attributes against one another then combining these attributes in a function of [2]. There are many resources allocated towards the maintenance of software overall, which sizably impacts costs [2]. Studies of how measures change overtime as the software is maintained were to verify the predictions of maintenance cost. Land describes how long-term software maintenance can deteriorate software overtime, thus impacting cost [2].

Relation to RSM Tool Metrics

The lexical level measurement method is related to the RSM tool metrics by using maintainability functions to calculate the total and averages of LOC and complexity within a project. With the RSM tool an analyst can effortlessly get function estimations for the average number of return points, maximum number of commented lines, or total number of blank lines. These calculations fall under the category of maintainability measures on lexical levels. Using the RSM tool metrics is beneficial in the ease of said calculations for large projects or in the developmental process of any software project.

References

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- 2. Land, Rikard. 3. *Artes.uu.se*, 2022. Measurements of Software Maintainability. 2022. http://www.artes.uu.se/events/gsconf02/papers/Land_Maintainability.pdf.