**Computer Vision for Assembly Line**

**(CVAL)**

**Function Point Analysis**

**1. Introduction**



**1.1 Purpose**  
Function point analysis measures software by quantifying the tasks and services (i.e., functionality) that the software provides to the user based primarily on logical design. The objectives of function point analysis are to measure:

* Functionality implemented in software, that the user requests and receives.
* Functionality impacted by software development, enhancement and maintenance independently of technology used for implementation.

**1.2 Use of Function Point**

Organizations can apply this International Standard to measure the size of a software product to:

* Support quality and productivity analysis
* Estimate cost and resources required for software development, enhancement and maintenance;
* Provides a normalization factor for software comparison
* Determine the size of a purchased application package by functionally sizing all the functions included in the package
* Assist users in determining the benefit of an application package to their organization by functionally sizing functions that specifically match their requirements

**1.3. Definitions, acronyms and abbreviations**

|  |  |
| --- | --- |
| EI | *External Inputs* (EI) - is an elementary process in which data crosses the boundary from outside to inside. |
| EIF | *External Interface Files* (EIF) - a user identifiable group of logically related data that is used for reference purposes only. |
| EO | *External Outputs* (EO) - an elementary process in which ***derived data*** passes across the boundary from inside to outside |
| EQ | *External Inquiry* (EQ) - an elementary process with both input and output components that result in data retrieval from one or more internal logical files and external interface files. |
| ILF | *Internal Logical Files* (ILF) - a user identifiable group of logically related data that resides entirely within the application boundary and is maintained through External Input |
| GSC | General System Characteristics |
| UFP | Unadjusted Function Points |
| VAF | The *value adjustment factor* (VAF) is based on 14 general system characteristics |
| DI | Degree of influence (Given out of 5) |
| j | Jones’ first order estimate exponent |

**1.4. References**

* A concise Introduction to Software Engineering, Pankaj Jalote
* <https://globaljournals.org/GJCST_Volume13/1-Software-Cost-Estimation.pdf>

**2. Calculation of Function Point**



**2.1 Identifying Boundaries**

The border between the application being measured and external applications or the user domain needed to be set first. A boundary is established in which functions are included in the function point count.

ILF : Image Analysis  
EI : Click Pictures, Operator Authorization  
EO : Operator Screen  
EQ : Log File Display

**2.2 UFP Calculation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Function  Type | Function Name | Function Complexity | Multiplier | Total |
| EI | Click Pictures | Low | 3 | 6 |
| Authorize Login | Low | 3 |
| EO | Display Defected Items | Average | 5 | 5 |
| EQ | Display Log File | Average | 5 | 5 |
| ILF | Image Analysis | High | 15 | 15 |
| Total Unadjusted Function Points (UFP) | | | | 31 |

**2.3 VAF Calculation**

|  |  |  |
| --- | --- | --- |
| GSC | DI | REASON |
| Data communications | 2 | Application is batch but has remote data  entry or remote printing. |
| Distributed data processing | 2 | Application prepares data for end user  processing on another component of the system. |
| Performance | 3 | Response time or throughput is critical during all business hours. No special design for CPU utilization was required. |
| Heavily used configuration | 2 | Timing considerations are included. |
| Transaction rate | 0 | No peak transaction period is anticipated. |
| On-Line data entry | 0 | No online data entry required. |
| End-user efficiency | 1 | Authorization by operator is required. |
| On-Line update | 0 | No online update required. |
| Complex processing | 2 | Extensive mathematical and logical processing |
| Reusability | 5 | The application was specifically packaged and/or documented to ease re-use, and the application is customized by the user at source code level. |
| Installation Ease | 1 | No special considerations were stated by the user but special setup is required for installation. |
| Operational Ease | 4 | The application is designed for unattended operation. Unattended operation means no operator intervention is required to operate the system other than to start up or shut down the application |
| Multiple Sites | 0 | User requirements do not require considering the needs of more than one user/installation site. |
| Facilitate Change | 0 | No changes are facilitated. |

Total Degree of Influence (TDI) = 22  
VAF = (TDI \* 0.01) + 0.65  
 = (22 \* 0.01) + 0.65  
 = 0.22 + 0.65  
 = 0.87

**2.4 FP Calculation**

FP = UFP \* VAF = 31 \* 0.87 = ***26.97 FP***

**3. Estimations**



After calculating the function point, Jones’ first order estimate method is applied to calculate the schedule and effort estimates. Value for the *Jones’ first order estimate exponent* is first chosen from the table given below and according to the project further formulae are applied.

|  |  |  |  |
| --- | --- | --- | --- |
| Kind of software | Best in class | Average | Worst in class |
| System | 0.43 | 0.45 | 0.48 |
| Business | 0.41 | 0.43 | 0.46 |
| Shrink Wrap | 0.39 | 0.42 | 0.45 |

**3.1 Schedule Estimation**

Number of months = (FP)^j = (26.97)^0.43 = ***4.12 months***

Note that the scheduled estimate does not include the requirement analysis phase as the phase was completed to get the design needed for the function point count.

**3.2 Effort Estimation**

Number of person-months = ((FP)^3\*j )/ 27 = (26.97)^1.29 / 27 = 70.119/27 = ***2.59 person-month***

**3.3 Cost Estimation**

Our source code is to be written in C++. According to standard metrics that are followed in the software world, *1 FP is equivalent to 53 lines of code of C++.*

26.97 FP = 26.97 \* 53 = 1430 LOC (approx)

According to the number of developers and the salaries to give them the cost for the project is estimated.