

# IMPLEMENTATION OF STUDENT ASSIGNMENT SYSTEM BASED ON MULTIPLE GRADE TYPES

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**Abstract:** Collecting, processing, distributing and storing the information is an integral part of today's information society. Because, information is today basic source of wealth. All countries with their organizations and institutions have large budgets to switch to the E-Government structure during the transition from industrial society to information society. In our country, E-Government project began as a priority with MERNIS project that storing all citizen information and it leads to other projects. In today software projects, different systems must be available to communicate with each others in order to exchange data and accurate processing of data is a requirement. The goal of paper is designing a software project which is available to communicate with MERNIS(one of a E-Government projects) and OSYM system, taking information from these system and also making an algorithm that evaluates students and places them depending on multiple grade system. This developed project has been tested with success and accuracy of results in the 2008-2009 academic year at the University of Beykent.

**Keywords:** Assignment Algorithm, MERNIS, E-Government, Web Services

**Özet:** Bilginin toplanması, işlenmesi, dağıtılması ve saklanması günümüz bilgi toplumunun ayrılmaz bir parçasıdır. Çünkü günümüzde temel zenginlik kaynağı bilgidir. Endüstri toplumundan bilgi toplumuna geçiş sırasında tüm devletler kurum ve kuruluşları ile e-devlet yani sayısal devlet yapısına geçmek için büyük kaynaklar ayırmaktadırlar. E-devlet projesi kapsamında ülkemizde öncelikli olarak vatandaşların bilgilerinin tutulduğu mernis projesi ile başlamış ve bu sarmal olarak diğer projeleri beraberinde getirmektedir. Artık farklı yazılım projelerinin bir birleri ile haberleşerek veri alış verişinde bulunmaları ve bilginin doğru işlenmesi günümüz projelerinin gereklerindedir. Bu tez çalışmasının amacı E-devlet projelerinde biri olan MERNIS projesi ve ÖSYM sistemi ile entegre çalışabilen, verileri kaynağından çeken çoklu puan türüne göre değerlendirme ve yerleştirme yapabilen bir yazılım projesi geliştirmektir. Geliştirilen projenin alfa testi Beykent Üniversite'sinde 2008-2009 öğretim yılında yapılmış ve başarılı bir sonuç elde edilmiştir.

**Anahtar kelimeler:** Yerleştirme Algoritması, MERNIS, E-Devlet, Web Servisleri

## 1. INTRODUCTION

As a result of improved and developed technologies, new definitions and concepts such as information society and information technology are brought into our life. Recently, software developed on different platforms must communicate in today applications. Thus, information stored in different database can be shared. With this share, most recent information can be reached and redundancies can be avoided. Therefore software developed by information technologies is more interactive and efficient. With these softwares, e-government is possible.

Competition is getting more effective in our life and in our new world. Life is getting a big competition. In today's global world people always have to face with assignment and selection in anywhere. The big example for such selection and assignment is OSYM (The Centre of Selection and Assignment of Student) exam system to place students to universities. This system is used in Turkey since 1974. University

candidates take OSYM exam and after exam students are placed in universities according to their point and their selections. Assignment need to do in correct way but for large number of students is really so hard to do it with out an algorithm or software system.

In this contribution, new student assignment system, which is available to communicate with MERNIS (one of a E-Government projects) and OSYM system, is introduced. Introduced system also has algorithm that evaluates students and place them depending on multiple grade system. This developed project has been tested with success and accuracy of results in the 2008-2009 academic year at the University of Beykent.

## 3. STUDENT ASSIGNMENT

### ALGORITHM

In assignment problem, there is student, their grades and selections. They are placed to their selection in bound of capacity of the selected unit. Students can't be placed

more than one selection or chose. Every selection has its own grade according to exam. In order to analyse the algorithm we need have units, their capacity and students. Let's assume we have units and their capacity in **Table 1**. There is 4 units and 26 available places.

**Table 1 : List of Units**

Unit No	Unit Name	Capacity
U1	Computer Engineering	5
U2	Medical	7
U3	Economy	6
U4	English Literature	8

There are list of students given in **Table 2** and their selections with grades given in **Table 3**. 26 of the 36 students need to assign to the units according to their selections and selection's grades.

**Table 2 : List of Students**

No	Name	No	Name	No	Name
S1	Ali	S13	Zeki	S25	İlknur
S2	Mehmet	S14	Musa	S26	Esra
S3	Can	S15	İsa	S27	Deniz
S4	Ayşe	S16	Emine	S28	Oğuz
S5	Fatma	S17	Sibel	S29	Hasan
S6	Hakan	S18	Semih	S30	Sezen
S7	Elif	S19	Gülben	S31	Türkan
S8	Ahmet	S20	Selda	S32	Tülay
S9	Ümit	S21	Arda	S33	Yavuz
S10	Sevgi	S22	Gökhan	S34	Osman
S11	Gözde	S23	Hakkı	S35	Fatih
S12	Handan	S24	Ceyda	S36	Yasemin

The assignment algorithm is run by repeating 3 nested steps. There are 2 control flags which are called **active** and **placed** flags. The meanings depend to flags are given below:

- Active = 1 and Placed = 0 : All selections's flags are in this position for initial. This status means the selection can use in assignment loop to place. We call this status as **Status I**.
- Active = 0 and Placed = 1 : If the selection flags is like this status that means selection is placed and it doesnt use in assignment loop anymore. Let's call this status as **Status II**.
- Active = 0 and Placed = 0 : If the selection flags is like this status that means selection is not be placed and it doesnt use in assignment loop anymore. This status is called as **Status III**.

**STEP I** : Each unit orders its own selections that are in **Status I** by descending order of points. Then each unit places the top selections according their blank capacity or in other words make placed selection's **active flag** as 0 and **placed flag** as 1. As a result of this step Computer Engineer placed 5 selections, Medical 7, Economy 6

and English Literature 8 selections. The placement can be seen in **Table 4**.

**Table 3 : The Selections and Points of Students**

No	I. Selection / Point	II. Selec. / Point	III. Selec. / Point	IV. Selec. / Point
S1	U1 / 90	U2 / 94	U3 / 99	U4 / 98
S2	U3 / 93	U2 / 95	U1 / 93	U4 / 97
S3	U4 / 100	U3 / 97	U2 / 93	U1 / 91
S4	U2 / 98	U1 / 92		
S5	U1 / 97	U2 / 92	U4 / 96	U3 / 100
S6	U2 / 97	U3 / 94	U4 / 95	U1 / 94
S7	U4 / 99	U3 / 95		
S8	U4 / 92	U2 / 96	U1 / 96	U3 / 98
S9	U3 / 92	U4 / 90	U2 / 91	
S10	U2 / 99	U3 / 96	U4 / 94	U1 / 95
S11	U3 / 91	U4 / 93		
S12	U2 / 100	U4 / 91		
S13	U1 / 76			
S14	U2 / 70			
S15	U3 / 89	U4 / 88	U1 / 77	
S16	U3 / 88	U2 / 77	U1 / 70	
S17	U4 / 86	U2 / 78	U1 / 75	U3 / 85
S18	U3 / 84	U4 / 89	U2 / 76	U1 / 74
S19	U2 / 71	U3 / 86		
S20	U1 / 72			
S21	U2 / 73	U1 / 71		
S22	U4 / 87	U1 / 79		
S23	U3 / 80			
S24	U2 / 79			
S25	U1 / 67			
S26	U3 / 68			
S27	U1 / 65			
S28	U2 / 69			
S29	U4 / 79			
S30	U3 / 66			
S31	U2 / 68			
S32	U2 / 66			
S33	U4 / 78			
S34	U1 / 55	U3 / 65	U4 / 76	
S35	U3 / 67			
S36	U2 / 65			

**Step II:** In first step, the algorithm does not control that students might be placed more than one selection. In this step, we control placed student if they are placed more than one selection. For this step, as see in **Table 5** algorithm orders all placed selections for each placed student. There is 11 different students are placed after **Step I** for the first iteration. For instance S1 is placed for his 3 of 4 selections or S4 is placed for his 1 of 2 selections. There must be no more than one placed selection for any student. So we must apply Step 2 to **Table 5** to passive those selections.

If student placed more than one selection then algorithm turns placed selections to passive other words make then **Status III** except for minimum number of placed selections. If there is any placed first selection for a student then selections of that student are set to **Status III** except for his first selection. That means this student is already placed for certain. As see in **Table 5**, students with S3,S4,S5,S6,S7,S10 and S12 number are placed exact. So all of those student's selections except for their first selections are set to **Status III**. However, students S1, S2, S8 and S11 are not placed to their first selections so algorithm set placed selections to passive other words set them to **Status III** except for the minimum order of the placed selections. After applying Step II result can be seen in **Table 6**. As seen in Table 6 students who placed in their first selection have no more active selection although students who not placed to their first selections can still have.

After applying Step II to **Table 4**, we have the result in **Table 7**.

**STEP III:** This step is for controlling if there is any free capacity in units and any selection in **Status I** for those units that have free capacity. If this control is return true then algorithm start with Step I again for new iteration. This Steps are following each others until there is no free capacity or no selection in Status I for unit that has free capacity. After 4 iterations the result can be displayed as seen in Table 8. As seen, there is no more free capacity or no more active selections (Status I) belongs to units that have free capacity. So the control returns false and the algorithm break itself from placement loop.

After second iteration (applying of Step I-II) we have next result as seen in **Table 8**;

After 4 iteration we have final result as seen in **Table 9**.

As a result of these steps, placement status of students can be seen in **Table 10** and point of students who placed depending on units can be seen in **Table 11**.

The Algorithm's flow chart can be seen in **Figure 1**. At first step, algorithm runs a control function which returns 1 or 0 before start to while loop. If control function returns 1 at initial which means that there is at

least a unit that has active selections and there is still free capacity for that unit. In the loop, it gets list of empty capacities of units (**EC**). For each unit in EC that has free capacity we select active selections of the unit by ordering points from max to min (**US**). In a new loop, place the selections in US until the free capacity. After do it for all units, now we apply Step II. The list of placed student is taken (**ST**). In a loop, for placed student, all selections which their order bigger than minimum order of placed selection set passive.

### 3. CONCLUSION

In this contribution, new student assignment system, which communicates with MERNIS (one of a E-Government projects) and OSYM system, was developed. In this paper also introduced new algorithm that evaluates students and place them depending on multiple grade system. This implemented software was used with success and accuracy of results in the 2008-2009 and 2009-2010 academic years at the University of Beykent.

#### CV's Umit CIFTCI



Beykent University as a member of software team.

#### Hasan H. BALIK



He was born in Daday in 1970. He had his graduate degree from Karadeniz Technical University, Electrical-Electronic Engineering in 1992, and then his doctor degree was gained from Bristol University in 1997. He worked at both Karadeniz Technical University and Firat University as assistant professor. Current he is member of Beykent University. He is working in Software Engineering Department as associate Professor. He is married and has two sons.

Table 4 : Applying of Step I

Computer Eng.			Medical			Economy			Eng. Literature		
No	Selection No	Point	No	Selection No	Point	No	Selection No	Point	No	Selection No	Point
S5	1	97	S12	1	100	S5	4	100	S3	1	100
S8	3	96	S10	1	99	S1	3	99	S7	1	99
S10	4	95	S4	1	98	S8	4	98	S1	4	98
S6	4	94	S6	1	97	S3	2	97	S2	4	97
S2	3	93	S8	2	96	S10	2	96	S5	3	96
S4	2	92	S2	2	95	S7	2	95	S6	3	95
S3	4	91	S1	2	94	S6	2	94	S10	3	94
S1	1	90	S3	3	93	S2	1	93	S11	2	93
S22	2	79	S5	2	92	S9	1	92	S8	1	92
S15	3	77	S9	3	91	S11	1	91	S12	2	91
S13	1	76	S24	1	79	S15	1	89	S9	2	90
S17	3	75	S17	2	78	S16	1	88	S18	2	89
S18	4	74	S16	2	77	S19	2	86	S15	2	88
S20	1	72	S18	3	76	S17	4	85	S22	1	87
S21	2	71	S21	1	73	S18	1	84	S17	1	86
S16	3	70	S19	1	71	S23	1	80	S29	1	79
S25	1	67	S14	1	70	S26	1	68	S33	1	78
S27	1	65	S28	1	69	S35	1	67	S34	3	76
S34	1	55	S31	1	68	S30	1	66			
			S32	1	66	S34	2	65			
			S36	1	65						

Status I  
Status II

Table 5 : Ordered Selection of Selected Students

S1	S2	S3	S4	S5	S6	S7	S8	S10	S11	S12	
Unit	Selec.	Unit	Selec.	Unit	Selec.	Unit	Selec.	Unit	Selec.	Unit	Selec.
u2	2	u2	2	u4	1	u2	1	u2	1	u4	1
u3	3	u1	3	u3	2	u1	2	u4	3	u3	2
u4	4	u4	4	u2	3	-	-	u4	3	u1	4
u1	1	u3	1	u1	4	-	-	u3	4	u3	2

Status I  
Status II

Table 6 : After Applying Step II

S1	S2	S3	S4	S5	S6	S7	S8	S10	S11	S12	
Unit	Selec.	Unit	Selec.	Unit	Selec.	Unit	Selec.	Unit	Selec.	Unit	Selec.
u2	2	u2	2	u4	1	u2	1	u2	1	u4	1
u3	3	u1	3	u3	2	u1	2	u4	3	u3	2
u4	4	u4	4	u2	3	-	-	u4	3	u1	4
u1	1	u3	1	u1	4	-	-	u3	4	u3	2

Status I  
Status II  
Status III

Table 7 : Step II –Iteration I

Computer Eng.			Medical			Economy			Eng. Literature		
No	Selection No	Point	No	Selection No	Point	No	Selection No	Point	No	Selection No	Point
S5	1	97	S12	1	100	S5	4	100	S3	1	100
S8	3	96	S10	1	99	S1	3	99	S7	1	99
S10	4	95	S4	1	98	S8	4	98	S1	4	98
S6	4	94	S6	1	97	S3	2	97	S2	4	97
S2	3	93	S8	2	96	S10	2	96	S5	3	96
S4	2	92	S2	2	95	S7	2	95	S6	3	95
S3	4	91	S1	2	94	S6	2	94	S10	3	94
S1	1	90	S3	3	93	S2	1	93	S11	2	93
S22	2	79	S5	2	92	S9	1	92	S8	1	92
S15	3	77	S9	3	91	S11	1	91	S12	2	91
S13	1	76	S24	1	79	S15	1	89	S9	2	90
S17	3	75	S17	2	78	S16	1	88	S18	2	89
S18	4	74	S16	2	77	S19	2	86	S15	2	88
S20	1	72	S18	3	76	S17	4	85	S22	1	87
S21	2	71	S21	1	73	S18	1	84	S17	1	86
S16	3	70	S19	1	71	S23	1	80	S29	1	79
S25	1	67	S14	1	70	S26	1	68	S33	1	78
S27	1	65	S28	1	69	S35	1	67	S34	3	76
S34	1	55	S31	1	68	S30	1	66			
			S32	1	66	S34	2	65			
			S36	1	65						

Status I  
Status II  
Status III

Table 8 : Result of Second Iteration

Computer Eng.			Medical			Economy			Eng. Literature		
No	Selection No	Point	No	Selection No	Point	No	Selection No	Point	No	Selection No	Point
S5	1	97	S12	1	100	S5	4	100	S3	1	100
S8	3	96	S10	1	99	S1	3	99	S7	1	99
S10	4	95	S4	1	98	S8	4	98	S1	4	98
S6	4	94	S6	1	97	S3	2	97	S2	4	97
S2	3	93	S8	2	96	S10	2	96	S5	3	96
S4	2	92	S2	2	95	S7	2	95	S6	3	95
S3	4	91	S1	2	94	S6	2	94	S10	3	94
S1	1	90	S3	3	93	S2	1	93	S11	2	93
S22	2	79	S5	2	92	S9	1	92	S8	1	92
S15	3	77	S9	3	91	S11	1	91	S12	2	91
S13	1	76	S24	1	79	S15	1	89	S9	2	90
S17	3	75	S17	2	78	S16	1	88	S18	2	89
S18	4	74	S16	2	77	S19	2	86	S15	2	88
S20	1	72	S18	3	76	S17	4	85	S22	1	87
S21	2	71	S21	1	73	S18	1	84	S17	1	86
S16	3	70	S19	1	71	S23	1	80	S29	1	79
S25	1	67	S14	1	70	S26	1	68	S33	1	78
S27	1	65	S28	1	69	S35	1	67	S34	3	76
S34	1	55	S31	1	68	S30	1	66			
			S32	1	66	S34	2	65			
			S36	1	65						

Status I  
 Status II  
 Status III

Table 9 : Final Iteration - Result

Computer Eng.			Medical			Economy			Eng. Literature		
No	Selection No	Point	No	Selection No	Point	No	Selection No	Point	No	Selection No	Point
S5	1	97	S12	1	100	S5	4	100	S3	1	100
S8	3	96	S10	1	99	S1	3	99	S7	1	99
S10	4	95	S4	1	98	S8	4	98	S1	4	98
S6	4	94	S6	1	97	S3	2	97	S2	4	97
S2	3	93	S8	2	96	S10	2	96	S5	3	96
S4	2	92	S2	2	95	S7	2	95	S6	3	95
S3	4	91	S1	2	94	S6	2	94	S10	3	94
S1	1	90	S3	3	93	S2	1	93	S11	2	93
S22	2	79	S5	2	92	S9	1	92	S8	1	92
S15	3	77	S9	3	91	S11	1	91	S12	2	91
S13	1	76	S24	1	79	S15	1	89	S9	2	90
S17	3	75	S17	2	78	S16	1	88	S18	2	89
S18	4	74	S16	2	77	S19	2	86	S15	2	88
S20	1	72	S18	3	76	S17	4	85	S22	1	87
S21	2	71	S21	1	73	S18	1	84	S17	1	86
S16	3	70	S19	1	71	S23	1	80	S29	1	79
S25	1	67	S14	1	70	S26	1	68	S33	1	78
S27	1	65	S28	1	69	S35	1	67	S34	3	76
S34	1	55	S31	1	68	S30	1	66			
			S32	1	66	S34	2	65			
			S36	1	65						

Status I  
 Status II  
 Status III

Table 10 : Placement Status of Students

No	Name	No	Name	No	Name
S1	Ali	S13	Zeki	S25	İlknur
S2	Mehmet	S14	Musa	S26	Esra
S3	Can	S15	İsa	S27	Deniz
S4	Ayşe	S16	Emine	S28	Oğuz
S5	Fatma	S17	Sibel	S29	Hasan
S6	Hakan	S18	Semih	S30	Sezen
S7	Elif	S19	Gülben	S31	Türkan
S8	Ahmet	S20	Selda	S32	Tülay
S9	Ümit	S21	Arda	S33	Yavuz
S10	Sevgi	S22	GSkhan	S34	Osman
S11	GSzde	S23	Hakkı	S35	Fatih
S12	Handan	S24	Ceyda	S36	Yasemin

Not Placed  
 Placed

Table 11 : Placed Students According to Units

Computer Eng.			Medical			Economy			Eng. Literature		
Name	Order	Point	Name	Order	Point	Name	Order	Point	Name	Order	Point
Fatma	1	95	Handan	1	100	Mehmet	1	93	Can	1	100
Ali	1	90	Sevgi	2	99	Ümit	1	92	Elif	1	99
Zeki	1	76	Ayşe	1	98	Gözde	1	91	Ahmet	1	92
Selda	1	72	Hakan	1	97	İsa	1	89	Gökhan	1	87
İlknur	1	67	Ceyda	1	79	Emine	1	88	Sibel	1	86
			Arda	1	73	Semih	1	84	Hasan	1	79
			Gülben	1	71				Yavuz	1	78
									Osman	3	76

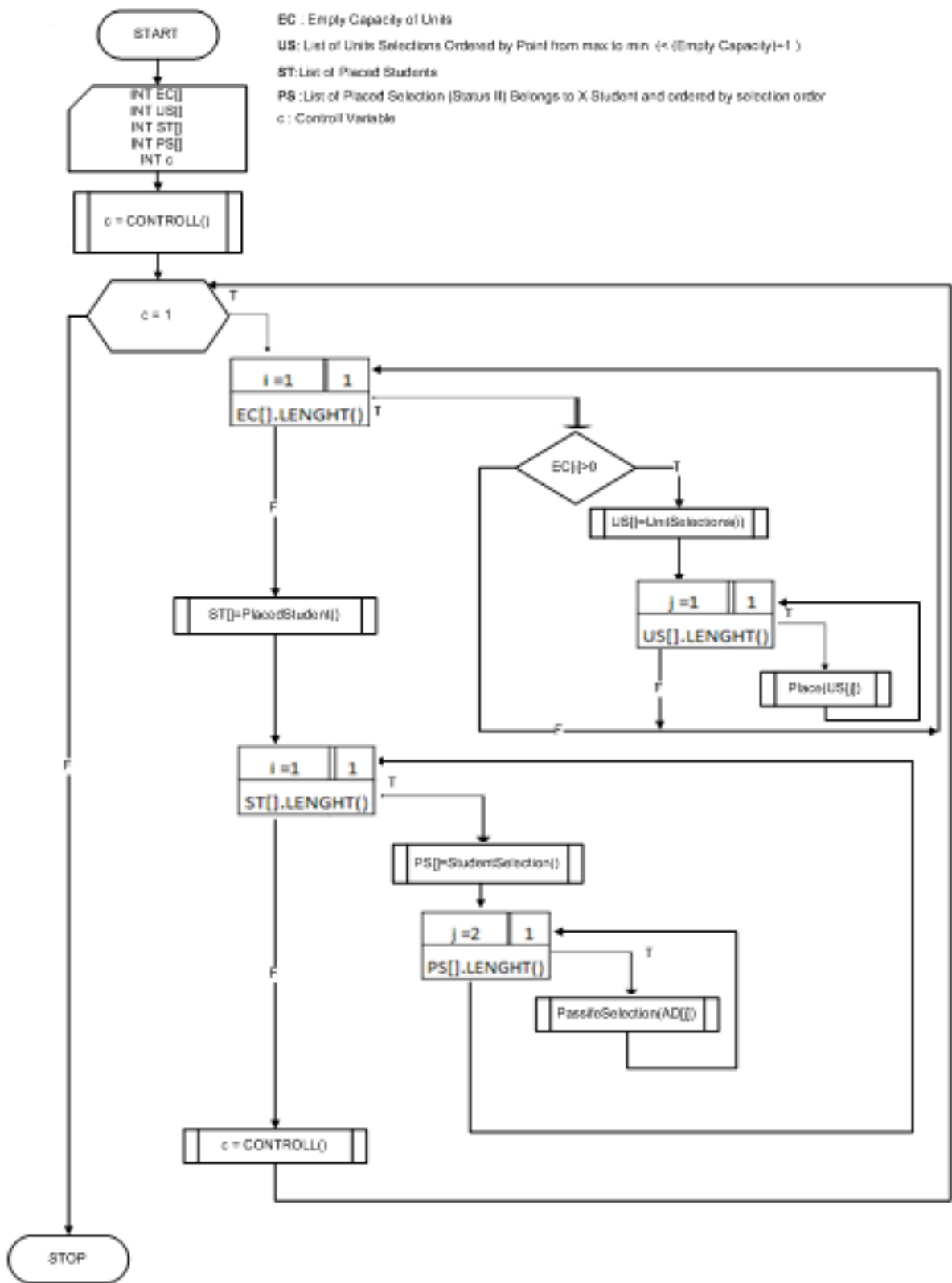


Figure 1 : The Flow Chart of Algorithm