Estimate The Time of Achievement of Activities of The Project Depending on the Properties of Prime Numbers.

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Abstract

The most important features of our time is to compete and development in all fields of life, among the most important these fields is building and construction, although the important role that represents construction projects in real life, but it is exposed to a number of problems and most of these problems are the delay in the completion of the non-receipt of the project on schedule,The reasons for this delay were not to using the scientific planning and review the projects like the method of networking analysis. By this paper, we tried to show new technique to estimate the time of achievement of activities of the project depending on the properties of prime numbers for fuzzy network.

Keywords: network analysis, project planning (PERT technique), fuzzy set and fuzzy numbers, prime numbers.

الخلاصة

ان من أهم سمات عصرنا هذا هو التنافس والتطور في جميع مجالات الحياة، ومن بين أهم هذه المجالات هو مجال البناء والتشييد، فعلى الرغم من الدور الهام المتمثل بمشاريع البناء في الحياة العملية الا انها تتعرض لعدد من المشاكل ومعظم هذه المشاكل هو التأخير في انجاز المشروع في الموعد المحدد له، أسباب هذا التأخير لعدم استخدام التخطيط العلمي ومراجعة المشاريع مثل تحليل الشبكات ، في هذا البحث استعراضنا اسلوب جديد مقترح في تقدير اوقات انجاز فعاليات المشروع معتمداً على خصائص الاعداد الاولية لشبكة الاعمال المضببة، ومقارنته مع اساليب اخرى وقد تعزز البحث بتنفيذ الاسلوب المقترح على حالة دراسية مستمدة من بيانات واقعية.

الكلمات المفتاحية: تحليل الشبكات، تخطيط المشاريع، المجاميع الضبابية، الاعداد الضبابية، الاعداد الاولية.

Introduction.1

The success of any economic plan that relies heavily on many aspects of the most important decisions any right to determine the safety and the preparation and evaluation and implementation of projects included in the plan, and often it is evaluating using simple methods are not based on scientific foundation, limiting the ability of existing evaluation process to expand the project in the analysis of the various aspects (Shemsham,2014).

Appearing of technique network planning, which is a method scientifically developed in the project planning and organization of the network reflect the temporal and logical sequence for implementation of the project operations and activities and interconnections among the form is also an effective regulatory tool by which to adjust the progress of the implementation process of the business in accordance with the programs planned and determine the necessary and timing of the resources, It helps the operators of the projects on the treatment of several problems, including: delays in the completion of project activities as a result of lack of time the project management in a scientific manner, the rise in costs, also can use network planning in project management(Fouad,2012).

Network analysis of the organization methods that can be used when there are several ways to get a job done, especially in the case of large projects, and this method has become one of the most important methods used in management, providing information that enables executives to make decisions on the basis of realistic intact as it is a model diagram employs the idea of the network to show the chain of activities that constitutes the project.

2. Definition of network analysis

Networking is one of the quantitative methods in the business curriculum that is used in the field of planning and supervision of the implementation of management Productivity and service projects, whether large or medium-sized ones and it is a quantitative methods for Operations Research, these networks are used in various fields, in practice, whether the construction of them, or productivity, or Scientific or service (Shemsham,2014).

3. Project Networks

Because of the great complexity of the resulting effect on the development of the society's needs and technological development projects in addition to the development of the technology and the implementation modalities showed weakness in project planning in terms of (Riyadh,2013):

- Show coherence between different activities of the project and flexibility in determining the beginning and end of each activity.
- Determine the effect of the delay on the activities of the time and cost of the overall project.

These reasons and others have created an urgent need to find alternative ways to avoid disadvantage of the previous scheduling tools, network planning appeared in the mid-fifties.

4. Advantages of networking diagrams:

For networking diagrams many benefits are possible, that can be summarized as follows (Steven, 2009):

Determine the start and end for the earliest time completion of activities.-
Determine the start and end for the latest time completion of activities.–
Determine the earliest start time and the Latest end time of activities.-
Calculate the flexibility time of activities. -
Identification of critical activities and critical path.–
Programming the lower costs of project. -

5. Types of representation activities:

a) Activity on Arc (AOA) Representation:

If we have two nodes i and j, Nodes represent the realizations of some (activities) of the project, arcs represent the activities. Node i, the immediate predecessor node of arc (i,j) is the start node for the activity. Node j, the immediate successor node of arc (i,j) is the end node for the activity.

b) Activity on Node (AON) Representation of Project Networks:

Also called Precedence Diagram Method (PDM), this system was used in preparation the project network sequential, after determining the field project work and the division of labor structure and Preparation a list of activities of the project and determines the logical relationships.

Network activities are serially numbered, where is given for each activity is only one number. It can be replaced by letters, each letter represents one activity only.

6. Dealing with uncertainty in estimating the times of activities of the project

The originators of PERT (Project Evaluation and Review Technique) proposed a stochastic approach to cope with probabilistic activity durations. Malcolm *et al*.(1959) proposed to use three estimates for each activity duration (the optimistic, the most likely and the pessimistic estimate). They modeled each activity duration as a stochastic variable with an appropriate beta distribution and they proposed a simple

approximate method to calculate the expectation and the variance of the network event times (Erik and Willy,2002).

Stochastic activity durations

With respect to the activity durations, the PERT model makes a number of fundamental assumptions:

- The activities of the project are independent. This assumes that duration estimates should be made independently of what may occur in other activities in the project.
- The probability density function (PDF) of (d_u) the random variable denoting the duration of activity u, can be approximated by the beta distribution; that is,

$$f(x|\alpha,\beta)=\begin{cases}\dfrac{\Gamma(\alpha+\beta+2)}{\Gamma(\alpha+1)\Gamma(\beta+1)}x^{\alpha}(1-x)^{\beta}, 0<x<1,\\ 0, \qquad otherwise\end{cases}$$

The mean of the beta density function (DF) can be approximated by

$$E(d_u)\cong\frac{a_u+4m_u+b_u}{6}$$

7. Fuzzy sets and Project Networks:

Definition 7.1.

The fuzzy subset $\tilde{A}$ universal setX, called the set of pairs $\tilde{A}=\{(\mu_{\tilde{A}}(x),x)\}$ where

$\mu_{\tilde{A}}(x):X\to[0,1],X$ in the interval $[0,1]$, is called the membership function of fuzzy set.

Definition 7.2.

Fuzzy number is an ordered pair of functions $(u(r),v(r)),r\in[0,1]$, which satisfy the following conditions (Almodars Barraq,2015):

1. u(r) is bounded left continuous non decreasing function over [0,1];
2.v(r)is bounded right continuous non increasing function over [0,1];
3. u (r) ≤v (r) r∈[0,1].

Definition 7.3.

Triangular fuzzy number $\tilde{A}$ is an ordered triple of numbers (a,b,c), determining the membership function $\mu_{\tilde{A}}(x)$ as :

$$\mu_{\tilde{A}}(x)=\frac{x-a}{b-a},\ x\in[a,b]\quad,\quad \mu_{\tilde{A}}(x)=\frac{c-x}{c-b},x\in[b,c],\quad \mu_{\tilde{A}}(x)=0,x\notin[a,c],$$

Note that the triangular fuzzy number (a,b,c) is a fuzzy number with functions :

$$v(r)=\frac{c-rc}{c-b},r\in[b/c,1]\quad ،r\in[a/c,b/c]\ u(r)=\frac{cr-a}{b-a},$$

A complement fuzzy set $\tilde{A}$, is denoted as $\tilde{A}^c$, It is a fuzzy set such that: $\mu_{\tilde{A}^c}(x)=1-\mu_{\tilde{A}}(x),\forall x\in X$ the intersection of two fuzzy sets $\tilde{A}$ and $\tilde{B}$ called fuzzy set $\tilde{C}$, such that: $\mu_{\tilde{C}}(x)=\mu_{\tilde{A}\cap\tilde{B}}=\min(\mu_{\tilde{A}}(x),\mu_{\tilde{B}}(x)),\forall x\in X$

The union of fuzzy sets $\tilde{A}$ and $\tilde{B}$ called fuzzy set $\tilde{C}$, such that:
$\mu_{\tilde{C}}(x)=\mu_{\tilde{A}\cup\tilde{B}}=\max(\mu_{\tilde{A}}(x),\mu_{\tilde{B}}(x)),\forall x\in X$

Fuzzy set $\tilde{A}$ called empty if $\mu_{\tilde{A}}(x)\equiv 0,\forall x\in X.$

A fuzzy set $\tilde{A}$ it called convex if $\mu_{\tilde{A}}(\lambda x+(1-\lambda)y)\geq\min(\mu_{\tilde{A}}(x),\mu_{\tilde{A}}(y))$ for

all $x, y \in X, \lambda \in [0,1]$.

8. Formulate a fuzzy number depending on the prime numbers within a period $[k_1, k_2]$

Definition 8.1.

Prime number $P_j(a) \geq 0$, $a \geq 0$, $j \in Z$, belonging to the interval $[a, \infty)$ when $j \geq 0$ or interval $[0, a)$ when $j < 0$ for a given, not necessarily a simple integer $a \geq 0$, will call j -th prime number relative to the number a.

There are many important characteristics for the prime numbers are summarized below (Almodars Barraq,2015):

1) $P_0(0) = 0$, $P_0(1) = 1$, $P_1(0) = 1$, $P_{-1}(1) = 0$;

2) $P_0(a) = a$, if $a \geq 0$ prime number, $P_0(a)$, not exist, if $a \geq 0$ non-prime numbers;

3) $P_j(a) \leq P_k(a)$, if $j \leq k$, $P_j(a) < P_k(a)$ with $j < k$, $j \in Z$, $k \in Z$;

4) $P_j(a) = P_j(a+1) = ... = P_j(a+l)$ for all $1 \leq l < P_{j+1}(a) - P_j(a)$, $j = 0,1,2,..,$ $a \geq 0$;

5) $P_j(a) = P_1(P_{j-1}(a)) = P_1(P_1(P_{j-2}(a))) = P_2(P_{j-2}(a)) = ... = P_{j-1}(P_1(a))$, If a number $a \geq 0$ prime number, $j \in Z$;

Definition 8.2.

Fuzzy integer $\tilde{n}$ we will call ordered three numbers *(k, n, l)*, $k \leq n \leq l$, $k, n, l \in Z$, where

$$k = \begin{cases} P_{-1}(n), n \geq 0, \\ -P_1(-n), n < 0, \end{cases} \quad l = \begin{cases} P_1(n), n \geq 0, \\ -P_{-1}(-n), n < 0, \end{cases}$$

$P_1(\cdot), P_{-1}(\cdot)$ ،represent the previous and the next number (prime) for the number n, $n \geq 0$,and $-n$ ، $n < 0$.

In other words, any fuzzy integer number $\tilde{n}$ it can be represented as triangular on the left k and on the right l it is the nearest prime numbers to $\tilde{n}$, this method allows for $n \in Z$, to be $\tilde{n} = (k, n, l)$,and Possible to put k and l according to the formula above with the use of linear membership function:

$$\mu_{\tilde{n}}(x) = 0, x \notin [k,l] \text{ ، } \mu_{\tilde{n}}(x) = \frac{l-x}{l-n}, x \in [n,l] \text{ ، } \mu_{\tilde{n}}(x) = \frac{x-k}{n-k}, x \in [k,n]$$

By using the definition of fuzzy integer number, the traditional arithmetic operations (addition, subtraction, multiplication and division) for any two fuzzy integer numbers $\tilde{n}$,$\tilde{m}$,is given as fuzzy numbers triangular (k_n, n, l_n) and (k_m, m, l_m) each respectively:

1. $\tilde{n} + \tilde{m} = (k_+, n+m, l_+)$, Where

$$k_+ = \begin{cases} P_{-1}(n+m), n+m \geq 0, \\ -P_1(-n-m), n+m < 0, \end{cases} \quad l_+ = \begin{cases} P_1(n+m), n+m \geq 0, \\ -P_{-1}(-n-m), n+m < 0, \end{cases}$$

2. $\tilde{n} - \tilde{m} = (k_-, n-m, l_-)$, Where

$$k_- = \begin{cases} P_{-1}(n-m), n-m \geq 0, \\ -P_1(-n+m), n-m < 0, \end{cases} \quad l_- = \begin{cases} P_1(n-m), n-m \geq 0, \\ -P_{-1}(-n+m), n-m < 0, \end{cases}$$

3. $\tilde{n} * \tilde{m} = (k_*, n*m, l_*)$, Where $k_* = \begin{cases} P_{-1}(n*m), n*m \geq 0, \\ -P_1(-n*m), n*m < 0, \end{cases}$

$l_* = \begin{cases} P_1(n*m), n*m \geq 0, \\ -P_{-1}(-n*m), n*m < 0, \end{cases}$

4. $\tilde{n} / \tilde{m} = (k_{div}, n/m, l_{div})$, $m \neq 0$, Where

$k_{div} = \begin{cases} P_{-1}(n/m), n/m \geq 0, \\ -P_1(-n/m), n/m < 0, \end{cases}$ $l_{div} = \begin{cases} P_1(n/m), n/m \geq 0, \\ -P_{-1}(-n/m), n/m < 0, \end{cases}$

5. $\tilde{n} \ \% \ \tilde{m} = (k_{\text{mod}}, n\%m, l_{\text{mod}})$, $n \geq 0$, $m > 0$, Where

$k_{\text{mod}} = \begin{cases} P_{-1}(n\%m), n\%m \geq 0, \\ -P_1(-n\%m), n\%m < 0, \end{cases}$ $l_{\text{mod}} = \begin{cases} P_1(n\%m), n\%m \geq 0, \\ -P_{-1}(-n\%m), n\%m < 0, \end{cases}$

It is necessary to draw attention to one of the important details, Including calculate any prime numbers relating to $a \geq 0$,at the same time prime numbers It is calculated $P_1(a)$ and $P_{-1}(a)$,The representation of any fuzzy integer number $\tilde{k}$ depended on k ,and characterized by parameters of membership function, therefore the representation period is unknown (fuzzy values). It can be considered fuzzy triangular numbers by membership function as a set of triangles

$\tilde{k} = \{(k_1, k, k_2)\}, k \in Z$ ، the prime numbers k_1, k_2 are calculate as follow:

$k_1 = P_{-1}(k), k_2 = P_1(k),$

According to the membership function above, for any fuzzy number $\tilde{k}$, can be determine the fuzzy triangular integer number $\tilde{k} = \{(k_1, k, k_2)\}$ by right and left limits (prime) that nearest to the number k .

9. Case study in the project of construction administration buildings

The project creation of administrative buildings municipality Hassanaoh (in Algeria) an important project, the municipality has achieved beneficial in the framework of the planned development program. As this project is of great importance both to the municipality in particular, or the state in general, It will be used as a barn belonging to the municipality, that is, it will be considered a source to bring money into the treasury of the municipality, as for the state it is considered as a liaison between the center of the state and the rest of the northern regions in the winter, The project consists of activities described in the table below.

Table (9.1) represented definition of the activities and precedence system

Activity	Name	Preceding activity	expected duration (day) by PERT	expected duration (day) by fuzzy numbers	expected duration (day) by prime numbers
Flattening	A	/	2.1	2.2	2.25
Drilling with the settlement in the form of well foundations with transportation to Public discharge	B	A	4.5	4.8	4.25
Concrete Packaging	C	B	7.3	7.3	7.5
Reinforced concrete for the foundations for the pillars	D	C	14.3	14.7	14

Reinforced concrete for the foundations for the beginning of the pillars	E	D	24	25	25
Reinforced concrete for the foundations for the Crossbar ground	F	E	24	25	25
Concrete Cleaning for the Tunnel garage of lubricating	G	F	6.8	7.3	7.5
Building walls and floor by Reinforced Cement for the Tunnel garage of lubricating	H	G	24	25	25
Internal coating with slab Cement for the wall of Tunnel garage of lubricating	I	H	.5	.3	.875
Supply / set up colored ceramic tiles boxes	J	I	.5	.3	.875
Backfill with soil suitable to knead with settlement	K	H	1.3	1	1.44
Drilling and settlement and completion basin to distract dirty water and rainwater	L	K	1.1	.5	1.25
Channels of compressed cement above the butterfly from sand	M	K	2	1.1	2.25
Supply / set up a layer of dry stones	N	L,M	1.1	.5	1.25
Brush the tile on Floor	O	N	1.1	.5	1.25
Supply / set up colored ceramic tiles boxes type 2	P	AH	6.3	4.2	6
Reinforced concrete in the height of the pillars	Q	O	26.2	26.7	25.5
Reinforced concrete in the height of the pillars of the crossbars	R	Q	31	31.7	30
Reinforced concrete in the height of the pillars of stairs	S	Q	31	31.7	30
Supply / set up Protective electrical wiring	T	Q	1	.5	1.25
Slab for empty objects	U	Q	31	31.7	30
Reinforced concrete in height	V	R,S,T,U	22.2	20.2	21.5

Reinforced concrete in the height of the pillars in the first floor	Q1	V	26.2	26.7	25.5
Reinforced concrete in the height of the pillars of the crossbars in the first floor	R1	Q1	31	31.7	30
Reinforced concrete in the height of the pillars of stairs in the first floor	S1	Q1	31	31.7	30
Supply / set up Protective electrical wiring in the first floor	T1	Q1	1	.5	1.25
Slab for empty objects in the first floor	U1	Q1	31	31.7	30
Reinforced concrete in height in the first floor	V1	R1,S1, T1,U1	22.2	20.2	21.5
Building a hollow wall with thickness 30cm	W	V	5	3.2	5
Building a hollow wall with thickness 10cm	X	V	2.9	1.6	3.25
Building a hollow wall with thickness 15cm	Y	V	5.5	4.1	5.25
Concrete lightly reinforced for the ceiling	Z	V	5.3	3.7	5.25
Supply / set up fund distribution of the high-type contain 13 exit + boycotted electric	AA	W,X,Y,Z	1.5	1	1.625
Supply / set up Packet switching	AB	W,X,Y,Z	.5	.3	.875
Supply / set up electric wire	AC	W,X,Y,Z	2	1.5	2.25
Coating with slab cement under the roof	AD	AA,AB,AC	3.4	2.5	3.25
Coating with slab cement on the inner wall	AE	AA,AB,AC	4.5	3.1	4
Slabs boxes	AF	AE,AD	5.5	4.2	5.875
Coating the stairs	AG	AF	2	1.1	2.25
Building a hollow wall with thickness 30cm	AH	AG	1.5	1	1.625
Supply / set up colored ceramic tiles boxes type 2 in the first floor	P1	AH1	3.8	2.6	3.75
Sanitary plumbing	AI	P,P1	5.8	3.3	6
Building a hollow	W1	V1	3.5	2.1	3.75

wall with thickness 30cm in the first floor					
Building a hollow wall with thickness 10cm in the first floor	X1	V1	5	3.2	5
Building a hollow wall with thickness 15cm in the first floor	Y1	V1	3.8	3.1	3.5
Concrete lightly reinforced for the ceiling in the first floor	Z1	V1	5	4.1	4.375
Supply / set up fund distribution of the high-type contain 13 exit + boycotted electric in the first floor	AA1	W1,X1, Y1,Z1	1.5	1	1.625
Supply / set up Packet switching in the first floor	AB1	W1,X1 ,Y1,Z1	.5	.3	.625
Supply / set up electric wire in the first floor	AC1	W1,X1, Y1,Z1	2	1.5	2.25
Coating by cement under ceiling in the first floor	AD1	AA1,AB1, AC1	1.8	1.1	1.8125
Coating by cement on the inner wall in the first floor	AE1	AA1,AB1, AC1	2.6	2	2.5
Slabs boxes in the first floor	AF1	AD1,AE1	3	2.1	3.25
Coating the stairs in the first floor	AG1	AF1	2	1.1	2.25
Building a hollow wall with thickness 30cm in the first floor	AH1	AG1	1.1	.5	1.25
Reinforced concrete wall in the height and the end of surface	AJ	V1	4.2	3.1	4
Shaped sliding on the surface	AK	AJ	.5	.3	.875
Holders multi-layers	AL	AK	.8	.3	1.0625
Thermal insulator by cork	AM	AL	1.1	.5	1.25
Steam Isolation	AN	AM	1.1	.5	1.25
craft paper	AO	AN	.5	.3	.875
Prevention by heavy gravel	AP	AO	.5	.3	.875
Raise the holder on slabs	AQ	AP	.5	.3	.875
Connecting the trunk by the lead	AR	AQ	.5	.3	.875
Coating by cement on the external wall	AS	AJ	5.5	5.7	5
Supply/ Set up the injectors of rain	AT	AS,AR	1.1	.5	1.25
Supply/ Set up doors of coarse wood with	AU	AI	2	1.1	2.25

scales no.1					
Supply/ Set up doors of coarse wood with scales no.2	AV	AI	2	1.1	2.25
Supply/ Set up doors of curtains of iron with paint	AW	AI	3	2.1	3.25
Supply/ Set up doors of coarse wood vitrified	AX	AI	2	1.1	2.25
Supply/ Set up windows of coarse wood with scales no.1	AY	AI	2	1.1	2.25
Supply/ Set up windows of coarse wood with scales no.2	AZ	AI	2	1.1	2.25
Supply/ Set up windows of coarse wood with scales no.3	BA	AI	2	1.1	2.25
Supply/ Set up windows of coarse wood with scales no.4	BB	AI	2	1.1	2.25
Supply/ Set up windows of coarse wood with a single shutter with scales no.1	BC	AI	2	1.1	2.25
Supply/ Set up windows of coarse wood (transom)	BD	AI	2	1.1	2.25
Supply/ Set up windows of coarse wood with a single shutter with scales no.2	BE	AI	2	1.1	2.25
Supply/ Set up protective antibodies from iron	BF	AI	2	1.1	2.25
Paint the exterior walls and filling gaps	BG	AU,AV, AW,AX, AY,AZ, BA,BB, BF,BE, BC,BD	8.5	7.1	8.5
Paint the joinery wooden and protective antibodies	BH	BG	1.1	.5	1.25
Supply/ Set up rectangular ceiling lamp type no.1	BI	BH	1	.5	1.25
Supply/ Set up rectangular ceiling lamp type no.2	BJ	BH	1	.5	1.25
Supply/ Set up circular ceiling lamp	BK	BH	.6	.5	.875
Supply/ Set up circuit	BL	BH	1	.5	1.25

breaker					
Supply/ Set up equipped with electricity	BM	BH	1	.5	1.25
Supply/ Set up fired ground from the copper	BN	BH	.5	.3	.875
Supply/ Set up Glass viscous	BO	BH	1.5	1	1.625
Drilling and settlement with Shaped tunnel	BP	G	1	.5	1.25
Build a fence wall with scales no.1 and completion of every other work	BQ	BP	5.5	5.7	5
Build a fence wall with scales no.2 and completion of every other work	BR	BP	21.5	21.7	21
Build a fence wall with scales no.3 and completion of every other work	BS	BQ,BR	2	2.2	2.25
Drilling and settlement for burial diesel tank	BT	BQ,BR	1.1	.5	1.25
Create an incentive for green space	BU	BS	.8	.5	1.0625
Concrete cleaning for the hole tank	BV	BT	5	5.3	5
Construction the wall and floor from the reinforced cement	BW	BV	28	24.3	26.5
Supply tanker of iron in order to fill it	BX	BW	.5	.3	.875
Backfill sand canyon to the hole tank	BY	BX	.8	.5	1.0625
Supply red soil for planting shrubs	BZ	BU	1.1	.5	1.25
Supply/ Set up Protective aluminum cover	CA	BY	1.1	.5	1.25
Slab filled to cover tanker	CB	CA	13.5	12.1	13.5
Supply and decorative stones placed on the walls of the facade the basic	CC	BZ	3.5	2.1	3.75
Supply/ Set up Base layer of gravel quarry	CD	CB	13.5	12.1	13.5
Supply/ Set up floor of light concrete	CE	CD	2.8	1.6	2.625
clean the place of the project to do bring all Instruments for provisional acceptance	CF	BI,BJ, BK,BL, BO,J, AT,CC, CE	.8	.5	1.0625

10. Estimate the time of the project by using the theory of fuzzy number:

Suppose that the activities of the project are connected with each other by the logical relation (finish-start) that is we cannot start the activity until after the end of the previous activity, In addition, the times of activities takes triangular distribution (a, b, c), such that:

a: refer to the minimum time to achieve the activity, taken it from the optimistic time.

b: refer to the middle term of time to achieve the activity, taken it from the most probable time.

c: refer to the maximum time to achieve the activity, taken it from the pessimistic time.

Let us give example to clarification how we get the last column of the above table if the achievement time of activity (E) consists of the optimistic time a=23, the most probable time b=24 and the pessimistic time c=29, by using the fuzzy number depending on the prime numbers (in paragraph 8) an sole it by the Robust's ranking technique (R.Nagarajan, A.Solairaju,2010), which satisfy compensation, linearity, and additively properties and provides results which are consistent with human intuition. If $\tilde{a}$ is a fuzzy number then the Robust's ranking is defined by

$$R(\tilde{a}) = \int_0^1 0.5(a_\alpha^L, a_\alpha^U)\, d\alpha$$

Where $[(a]_\downarrow \alpha^\uparrow L, a_\downarrow \alpha^\uparrow U)$ is the α- level cut of the fuzzy number $\tilde{a}$.

11. The Results and compare among PERT technique, fuzzy numbers and proposal technique:

We depend on WINQSB to solve network project and get the results:

1. When we use PERT technique to estimate the time of achievement the project, we get the following critical path (critical activities) A, B, C, D, E,F, G, H, K, M, N, O, Q, R or S or U, V, Q1, R1 or S1 or U1, V1, Z1 or X1,AC1, AE1, AF1, AG1, AH1, P1, Ai, AW, BG, BH, BO, CF, and then the achievement time of the project is 311.5 days.
2. When we use fuzzy numbers which is represented by fuzzy time of activities (traditional fuzzy numbers)[ ], we get the following critical path (critical activities) A, B, C, D, E,F, G, H, K, M, N, O, Q,R or S or U, V, Q1, R1 or S1 or U1, V1, Z1, AC1,AE1,AF1,AG1,AH1,
   P1, AI, AW, BG, BH, BO, CF, and then the achievement time of the project is 300 days.
3. When we applied the proposal technique which is depend on fuzzy prime numbers, we get the following critical path (critical activities) A, B, C, D, E,F, G, H, K, M, N, O, Q,R, V, Q1,R1,V1,A1,AW, BG, BH, BO, CF, and then the achievement time of the project is 292.38 days.

Conclusions

Project management is one of the important systems within the management and economic systems in relation to time, time is commodity given equally unique for each person, so it appear several methods to complete the project at a specific time, perhaps, the most important it is the use of network planning.

Through getting the results that have been reached through the proposed technique which is depending on estimate the times of each activity by prime numbers, we propose to follow the Fuzzy network in estimating the time of project activities.

Note through the comparison among the three methods, it is possible to depend on the proposed method for its achievements best results of the two methods with comparative.

References

Almodars Barraq Subhi Kaml,2015, Improve the methods and algorithms of fuzzy linear programming problems with limited resources, Doctorate dissertation, National University of Kyiv,Kyiv.

Erik L. Demeulemeester, Willy S. Herroelen, 2002," PROJECT SCHEDULING A Research Handbook", Kluwer Academic Publishers.

Fouad Zamit, 2012," Projects management techniques by using network analysis", Master thesis introduce to Masila University (Algeria.

R.Nagarajan, A. Solairaju,2010," Computing Improved Fuzzy Optimal Hungarian Assignment Problems with Fuzzy Costs under Robust Ranking Techniques", International Journal of Computer Applications, Volume 6–No.4,September.

Riyadh Al-Hussain,2013,"Management of engineering projects", lectures in Department of Engineering Management, Faculty of Civil Engineering, Damascus University.

Shemsham Hafedha, 2014," The trade-off between traditional and modern networks models in planning and review projects", Master thesis introduce to Mohamed khider university (Algeria).

Steven A. Gabriel,2009,"Project Management LP Models in Scheduling, Integer Programming", www.eng.umd.edu/~sgabriel.