Visualization of Construction using 4d Geographical Information Systems (GIS) for Residential Building

Shaik Madeena, Dinesh Singh

Abstract: ***Construction industries perform different set of activities requires execution as per prepare scheduling. However, scheduling software's such as PRIMAVERA, MS project etc., could not provide 3 dimensional spatial aspects of information of construction. In this regard, Geographical information system could overcome this limitation of the scheduling software's and produced 3D visualization of 3D model. This system utilizes 2D drawings from AutoCAD and schedules prepared in PRIMAVERA software in order to generate 3D visualization of the construction project. The objective of the study is to integrate 3D information and scheduling and visualization of construction projects of residential building in Vuyyuru town, Krishna district, Andhra Pradesh. Thus created GIS based 4D (x, y, z and time) model useful for optimization, decision making and temporal monitoring of the workflow of the project at the site as well as in detecting logical errors that occur in project schedule.***

Index Terms: ***AutoCAD, Primavera, Geographical information system (GIS), Scheduling, Visualization.***

I. INTRODUCTION

Recently, constructing infrastructure project has become more complex and challenging task than ever due to fast growth and demand. The recent imaginative devices can bolster project organizers to design and oversee construction projects all the more successfully and proficiently. Visualization is considered as a standout amongst the most vital devices for accomplishing this reason The disappointment of conventional procedures, for example, bar graphs and the basic way technique to give the data relating to spatial parts of a construction project have roused the exploration exertion to fuse visualization into project scheduling and advancement control [9]. Retik featured that visual reenactment of a construction procedure may help an organizer in a superior view of a project and in the reconciliation of other gatherings' exercises in the arranging process [10]. A visual portrayal of the schedule can be reached out to observing the construction advance, yet in addition improves correspondence on location including plant and hardware the executives. The venture supervisor and customer can utilize the visualization perspectives at any phase of the undertaking to screen the exercises and cost stream. [1-8].

The conventional methodology for scheduling and advancement checking techniques likes bar charts, Critical Path Method (CPM), Program Evaluation Review techniques (PERT) and so on are as yet being utilized by the venture chiefs for arranging. However, not helpful in the decision making process, due to lack spatial aspects and data. The delivery time and optimum costs another requirement in the construction without a decrease in the quality of the project. GIS and project management tools can be integrated to get to the spatial angles and the time and cost engaged with the project. GIS permits getting the accurate information of the project and monitoring of activities. The project chief and customer can utilize the visualization angles at any phase of the project to screen the exercises and cost stream [1]. Construction quality directors and surveyors can receive the portable GIS as an advantageous instrument to gather, oversee and share data relating to quality investigation amid various period of construction [3]. The GIS 3D model can deal with the broad venture, which contains more destinations in a single stage and gives the leaders with sufficient data to decide the best answer for the issues at each site. Connecting the database with the 3D model was a helpful reference [4].

As GIS is one of the quick developing fields being used in different building ventures, its total potential to the construction business has not been acknowledged yet. GIS enhance the construction arranging what's more, plan proficiency by joining of spatial and characteristic data in a solitary situation [8]. This paper manages the detailing of 4-D model of multi storied building utilizing AutoCAD, Primavera P6 and Arc GIS. This work is required to help in envisioning the advancement of work, subsequently limiting deferrals and cost overwhelms. To demonstrate the feasibility of the work it's done on a residential building.

II. RESEARCH SIGNIFICANCE

To integrate 2D Architecture drawing of AUTO-CAD and prepared schedule of each activity work in sequence by PRIMAVERA (p6) in ARCGIS for visualization of construction progress.

III. DESCRIPTION OF WORK

The present examination is to talk about the system for the formation of a GIS based 4D model of the Venture and reenact it to screen the work process at the site. Distinctive phases of the development procedure furthermore, exercises are created in various utilizing ArcGIS programming. Primavera P3 has been utilized for formation of the calendars and these are connected with the GIS layers. The means that are included in this procedure of age of the 4D show are portrayed in the accompanying segments.

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Shaik Madeena, Department of Civil Engineering, Koneru Lakshamiah Educational Foundation, Guntur, AP, India.

Dinesh Singh, Department of Civil Engineering, Koneru Lakshamiah Educational Foundation, Guntur, AP, India.

A. Formation of Structural Drawings

The underlying advance is the development of the plans of the endeavor. For a prevalent model, it is required to have the plans at different periods of the task; these designs can be created in AutoCAD in this present undertaking for the production of the plans at various dimensions. The more the quantity of plans, more will be the precision of the 3d display. Fig.1. typical floor plan.

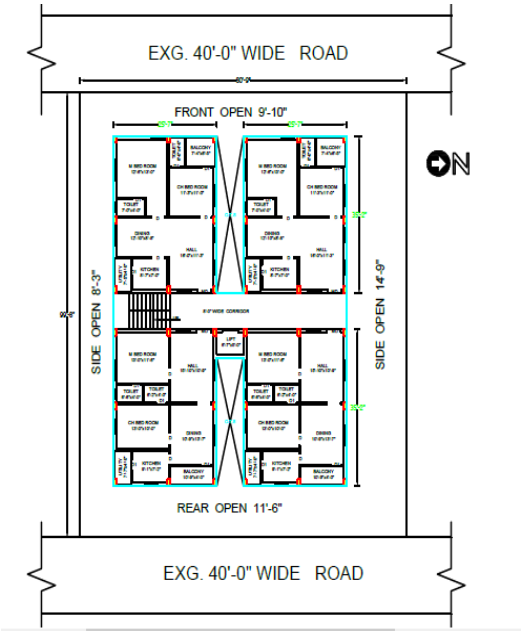

Fig. 1: Typical floor plan

B. Work Breakdown Structure (WBS)

The procedure of distinguishing proof of the WBS includes an alternate methodology for various activities. For the present venture, the dimensions of work recognized for WBS are: Footing PCC, Foundation, Plinth Beam, Floor, Columns. Fig. 2 indicates work breakdown structure.

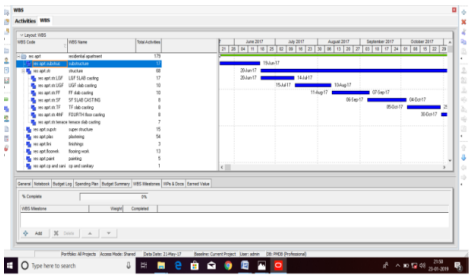

Fig. 2: Work breakdown structure.

C. The Activities in schedule

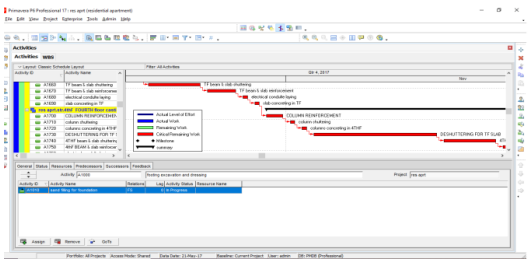

Fig. 3: Activities schedule

The above Fig. 3 gives an idea about Activities schedule.

D. Import 2D drawing to ARC MAP

In ARCMAP have create shape files of each compound of imported AUTOCAD drawings in two dimensions. For all shape files in ARCMAP should provide XY coordinate system for spatial aspects, geo referencing of shape file can be done by adding coordinate points, so that we trace exact location of building. Linking of schedule can do in join for generating of shape file in ARCMAP. Fig. 4 shows column, stair case, slab, external walls and inner walls shape file in ARCMAP.

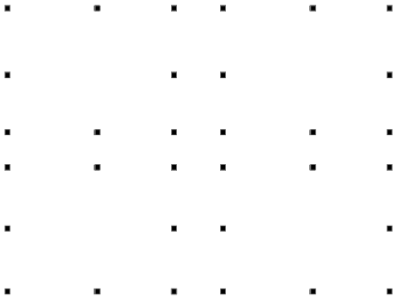

Fig. 4a: Columns

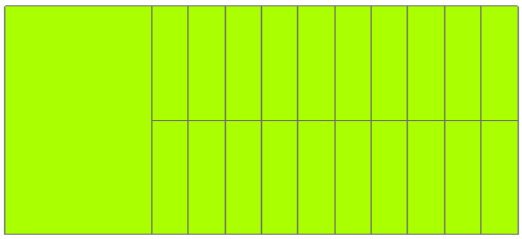

Fig. 4b: Stair case

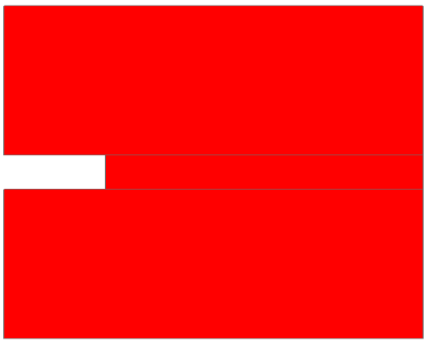

Fig. 4c: Slab

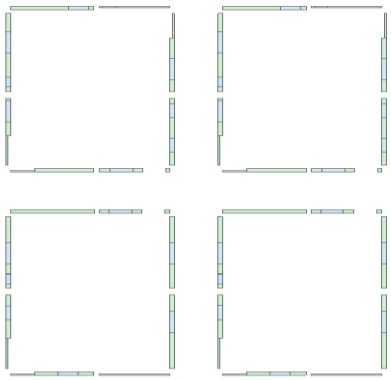

Fig. 4d: External walls

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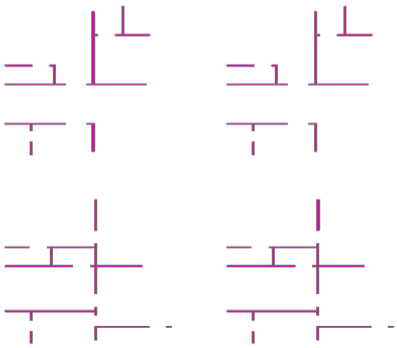

Fig. 4e: Inner walls

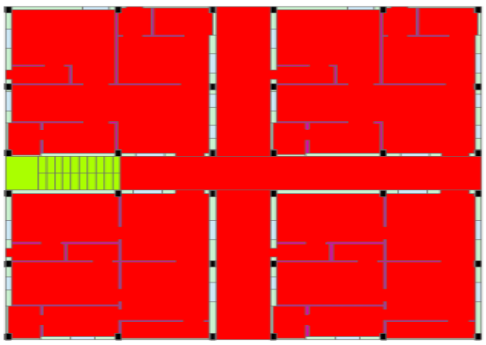

Fig. 4f: All Shape File

Fig.4: Shape files prepared from 2d plan

3D Visualization: Arc scene has been utilized to generate 3D view of different activities from respective 2D shape files.

IV. RESULT AND DISCUSSION

This progression includes the sending out of the dimensions for AUTO CAD illustrations into Arc Scene. Initial, an Anticipated Coordinate System dependent on the Indian Coordinate framework is characterized. Utilizing the anticipated arrange framework as a base, the AUTO CAD illustrations are then changed over into Shape files. The rise subtleties, which are now recognized, are presently utilized as the base statures and expulsions. After the layers are added to Arc Scene, base tallness, i.e., the stature of the item from establishment level and expulsion, i.e., its 3D stature are given. Fig. 5 is attribute table. Fig. 6 is Extrusion of building.

FID	Shape *	Id	AREA	length	width	height	perimeter	volume
0	Polygon	0	162	18	9	125.9	54	20395.8
1	Polygon	0	162	18	9	125.9	54	20395.8
2	Polygon	0	162	18	9	125.9	54	20395.8
3	Polygon	0	162	18	9	125.9	54	20395.8
4	Polygon	0	162	18	9	125.9	54	20395.8
5	Polygon	0	162	18	9	125.9	54	20395.8
6	Polygon	0	162	18	9	125.9	54	20395.8
7	Polygon	0	162	18	9	125.9	54	20395.8
8	Polygon	0	162	18	9	125.9	54	20395.8
9	Polygon	0	162	18	9	125.9	54	20395.8
10	Polygon	0	162	18	9	125.9	54	20395.8
11	Polygon	0	162	18	9	125.9	54	20395.8
12	Polygon	0	162	18	9	125.9	54	20395.8
13	Polygon	0	162	18	9	125.9	54	20395.8
14	Polygon	0	162	18	9	125.9	54	20395.8
15	Polygon	0	162	18	9	125.9	54	20395.8
16	Polygon	0	162	18	9	125.9	54	20395.8
17	Polygon	0	162	18	9	125.9	54	20395.8
18	Polygon	0	162	18	9	125.9	54	20395.8
19	Polygon	0	162	18	9	125.9	54	20395.8
20	Polygon	0	162	18	9	125.9	54	20395.8
21	Polygon	0	162	18	9	125.9	54	20395.8
22	Polygon	0	162	18	9	125.9	54	20395.8
23	Polygon	0	162	18	9	125.9	54	20395.8
24	Polygon	0	162	18	9	125.9	54	20395.8
25	Polygon	0	162	18	9	125.9	54	20395.8
26	Polygon	0	162	18	9	125.9	54	20395.8
27	Polygon	0	162	18	9	125.9	54	20395.8
28	Polygon	0	162	18	9	125.9	54	20395.8
29	Polygon	0	162	18	9	125.9	54	20395.8
30	Polygon	0	162	18	9	125.9	54	20395.8
31	Polygon	0	162	18	9	125.9	54	20395.8

Fig. 5: Attribute table.

Fig. 6a: Columns extrusion (height =125.9 inch)

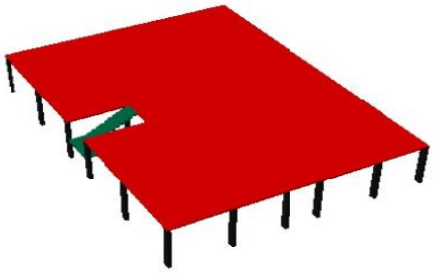

Fig. 6b: Slab Extrusion (Slab Thickness=4.9 Inch)
B. slab and stair case extrusion

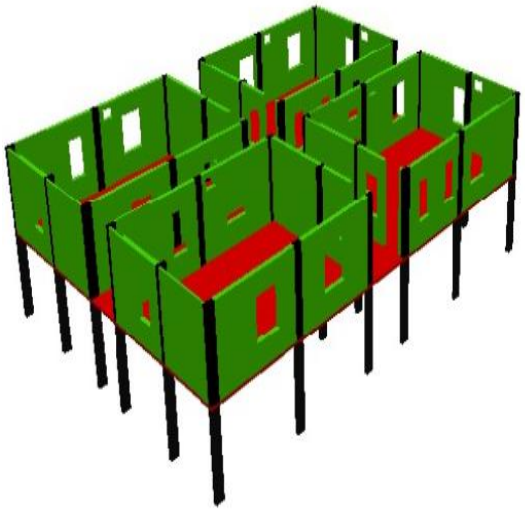

Fig. 6c: External walls extrusion

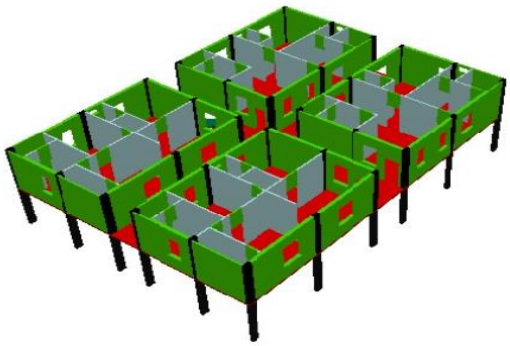

Fig. 6d: Inner Walls Extrusion

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Fig. 6e: Visualization of whole building

Fig. 6: Extrusion of building

V. CONCLUSION

This paper exhibited the formation of 4D display utilizing GIS, which can go about as an option for other existing customary 4D PC helped configuration device. This framework can be utilized as an apparatus for timetable administration, arranging and compelling representation of the work. The principle preferred standpoint of the framework is that the covering and modify can be kept away from and consequently decrease delay.

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AUTHORS PROFILE

Shaik Madeena is pursuing MTech degree in construction technology from Koneru Lakshmaiah Education Foundation Andhra Pradesh. He completed his B.tech degree in civil engineering from Dhanekula institute of engineering and technology (DIET) in 2017. He attended an international conference on green buildings and actively participated in seminars and workshop

Dr. Dinesh Singh, PhD, working as an Associate Professor in Department of civil engineering at Koneru Lakshmaiah Educational Foundation Ph.D in from IIT Roorkee, Specialization Geomatics Egg. Research area Remote Sensing and GPS.
ResearchGate Id:
https://www.researchgate.net/profile/Dinesh_Singh45