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Analysing Hybrid Cooperative Coevolution Algorithm Framework For Large Scale Construction Project Schedule

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Abstract: *A construction project which involves multiple contractors will always slip away and delay from the project master schedule because of lack of communication and mismanagement of schedule to avoid this problem various studies have been followed but the results are not positive so in this a new method of framework is going to implement. The framework is based on a method of Hybrid cooperation coevolution algorithm based on the algorithm. In this we rank the constrains that affect the project schedule by analysing the survey results and then the framework will be formed according to the constrains to improve the schedule process. we can subdivide the schedule and daily task allotment so that the planned schedule will not slip away Construction projects involve complex processes and multiple stakeholders, which makes it challenging to manage project schedules effectively. To address this issue, a Hybrid Cooperative Framework for Large Scale Construction Project Schedule Analysis (HCF) has been proposed. This framework combines traditional project management techniques with advanced machine learning algorithms to enhance the accuracy of project schedules and improve project performance. In this study, we aim to analyze the effectiveness of the HCF in managing large-scale construction projects. We will evaluate the framework's ability to improve project scheduling accuracy, reduce project delays, and enhance stakeholder collaboration. The study's findings will provide valuable insights into the application of advanced technologies in construction project management and contribute to the development of more efficient project scheduling approaches.*

Keywords: coevolution algorithm

I. INTRODUCTION

Construction projects are complex undertakings that involve multiple stakeholders, including owners, architects, contractors, and subcontractors. In order to complete projects on time and within budget, effective planning and coordination are essential. However, traditional project management methodologies often fall short in addressing the dynamic and unpredictable nature of construction projects. As a result, there is a growing interest in integrating agile methodologies into construction schedules to improve flexibility and adaptability. This paper presents a framework for implementing hybrid cooperation in construction schedules, which integrates traditional and agile project management approaches. The framework is based on the concept of cooperative planning, where team members work collaboratively to identify potential issues and develop solutions. The approach also incorporates real-time data analysis and visualization tools to support decision-making and enhance communication among team members.The benefits of using this framework include improved scheduling accuracy, reduced delays, and increased productivity. By adopting a hybrid approach to construction scheduling, project teams can benefit from the strengths of both traditional and agile methodologies, resulting in greater success and profitability. The following sections will provide a more detailed overview of the framework and its key components.

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II. CONSTRUCTION SCHEDULE PROCESS

A construction schedule serves as a complete blueprint for how and when a project will be completed. To keep everything on schedule and under budget, a construction schedule outlines project durations and milestones and monitors project progress. It serves as the foundation of all successful construction project management.Scheduling for construction requires a variety of resources, stakeholders, and players. There are always a lot of subcontractors involved in a construction project, so start by identifying them all. Once you get the list, contact the people on it and find out how long it will take to get the items. Then, inquire as to the anticipated duration of their portion of the project. The accuracy of your time estimation depends on this. A list of requirements and the inspections that will be required during the build must also be obtained from the local code office. You must conduct the necessary study to ensure that your project complies with all applicable code requirements because they differ depending on the sort of building and materials you'll be using.The project needs to be broken down into the steps that will take it from a building plan to a completed project now that you have the context and resources necessary. These are the assignments. A complete inventory of every activity that has to be completed for the construction to be successful is a requirement before you can create an accurate construction timetable.A work breakdown structure (WBS) can help you understand the scope and scale of your project. This tool can be used to visualise your deliverables by starting with anything you're going to build and then disassembling it until you reach the most basic components.

It doesn't hurt to collect the team and any subcontractors you plan to use at this time and ask them for advice. Keep in mind that your job list will be more accurate and your building schedule will be more detailed. Keep in mind that tasks are what might cause a project to fail, therefore focus on the scope. Remember that certain jobs depend on others, so link those together as well. You must arrange the tasks on your task list after it is as complete as feasible. The WBS can help with this since it simplifies complex projects by identifying their key components and the critical dates for their completion. To distribute these jobs throughout the course of a project timetable, use Gantt chart software.

III. HCCA FRAMEWORK

HCCA consists of a symmetric local search plus Nelder-Mead and a cooperative co-evolution algorithm (CC) with a backtracking strategy for optimising the positions and PTO settings of WECs, respectively. For assessing the effectiveness of the proposed approach five popular Evolutionary Algorithms (EAs), four alternating optimisation methods and two recent hybrid ideas (LS-NM and SLS-NM-B) are compared .The Hybrid Cooperative Coevolution (HCC) framework is a computational optimization technique that can be used to develop construction schedules. Here are the steps you can follow to create a construction schedule using the HCC framework: Define the optimization problem: The first step in developing a construction schedule using the HCC framework is to define the optimization problem. This involves identifying the objective function and the constraints that need to be satisfied. Decompose the problem: Once the optimization problem has been defined, the problem can be decomposed into smaller sub-problems. Each sub-problem represents a component of the construction schedule. Determine the solution space for each sub-problem: After decomposing the problem, the solution space for each sub-problem must be determined. This involves defining the variables that need to be optimized, the bounds on the variables, and any other relevant information. Develop a cooperative coevolution algorithm: The cooperative coevolution algorithm is a meta-heuristic optimization algorithm that can be used to solve the sub-problems. The algorithm involves breaking the problem into sub-problems and optimizing each sub-problem individually. The solutions to the sub-problems are then combined to generate a final solution to the problem. Develop a hybridization strategy: In order to improve the performance of the cooperative coevolution algorithm, a hybridization strategy can be developed. This involves combining the cooperative coevolution algorithm with other optimization techniques such as simulated annealing or genetic algorithm's. Implement and evaluate the framework: Once the cooperative coevolution algorithm and hybridization strategy have been developed, the framework can be implemented and evaluated. The framework should be tested on a variety of construction projects to ensure that it is effective and efficient

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IV. STEPS TO IMPLIMENT HCCA FRAMEWORK

Identify the project goals and scope: Determine the overall goals and scope of the project, as well as the specific objectives that need to be achieved. This will help you identify the tasks that need to be completed and the resources required.

- Create a Work Breakdown Structure (WBS): Use the project scope to create a WBS in Microsoft Project. This will help you break down the project into smaller, more manageable tasks.
- Identify task dependencies: Determine the dependencies between tasks and establish them in Microsoft Project. This will help ensure that tasks are completed in the correct order and that the project stays on track.
- Determine resource availability: Identify the resources required for each task and determine their availability. This will help you manage resource allocation and avoid overloading resources.
- Create a hybrid cooperative framework: Implement a hybrid cooperative framework that combines elements of agile and traditional project management methodologies. This will involve creating a project plan that is flexible, iterative, and collaborative, while also maintaining a structured schedule.
- Establish communication channels: Set up communication channels in Microsoft Project that allow team members to collaborate and share information. This can include tools like SharePoint, Teams, or other collaboration software.
- Track progress: As work is completed, update the project schedule in Microsoft Project. Use the % Complete field to track progress and make adjustments to the schedule as needed.
- Monitor risks: Identify potential risks to the project and establish risk management strategies in Microsoft Project. This can involve creating contingency plans, monitoring risks regularly, and taking corrective action when necessary.
- Generate reports: Use Microsoft Project to generate reports on the project's progress, including Gantt charts, resource utilization reports, and other reports as needed. This will help you track the project's progress and identify areas where improvements can be made

V. LITERATURE REVIEW

Xiaoling Wang (2020) This paper deals with robustness measure is an effective tool to evaluate the anti-interference capacity of the construction schedule. The construction industry is well-known for its complexity, uncertainty, and risk. As a result, construction project schedules are often subjected to various sources of uncertainties that can affect their robustness. To address this challenge, researchers have proposed a construction schedule robustness measure based on improved prospect theory and the copula-CRITIC method the construction schedule robustness measure based on improved prospect theory and the copula-CRITIC method is a valuable tool for evaluating the robustness of construction project schedules. Its use can lead to better decision-making, improved project management, and reduced risk in the construction industry

Ehab Kamarah (2020) The complex category of repeating projects that involve dispersed sites—such as programmes for many bridges, multiple schools, etc.—are the subject of this research. The study suggests a framework for schedule optimization with four novel elements: (1) a scheduling algorithm that effectively distributes the crews among dispersed sites, taking into account the activities' independent site sequences as well as the time and cost of travelling between sites; (2) cost optimization that takes deadlines, crew limits, and optional construction methods into account to determine the activities' optimum crews, methods, and site sequences; (3) interactive documentation of all progress events to support re-scheduling during construction; and (4) a readable schedule. A computer prototype was created and tested using a case study from real life and literary samples. Activity-specific site sequences demonstrated very adaptable optimization.

Abdulrahim Shamayleh (2020) Sustainability-related risks and risk management frameworks have been introduced in the literature to help project managers identify and manage critical risks influencing project sustainability. Theoretically grounded in the framework of Monte Carlo Simulation, this paper introduces and operationalizes a new process for prioritizing sustainability-related project risks using risk matrix data. Sustainability-related construction project risks have never been assessed relative to different confidence levels across the risk matrix-based exposure zones. The

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application of the proposed process on construction projects completed in the United Arab Emirates reveals that the conventional risk prioritization scheme undermines the importance of tail risks (unexpected events), whereas such risks are captured in the proposed process. The proposed process is generalizable to prioritizing risks influencing sustainability in international construction projects and beneficial for enhancing project sustainability as there is a huge uncertainty associated with sustainability-related risks.

Fanmin Meng (2022) This paper deals with an important task of construction project management, construction schedule management is related to the realization of project period, cost, quality, and other objectives. However, in actual construction, problems such as difficulties in plan implementation and management are often encountered, and schedule delays often occur. Moreover, with the increase in the scale and complexity of modern buildings, the management of construction schedules has brought about larger issues and higher requirements have been put forward for the management level of the construction schedule. The traditional timetable management and scheduling is not highly relevant to the project entity.

Songsong Li (2022) The construction of urban rail transit (URT) plays a vital role in urban development, and the planning of URT network construction schedule is crucial. The current methods for determining the construction schedule rely mainly on qualitative analysis, such as experience, comparisons with other cities, and expert opinions. In this study, a double-level quantitative model is proposed based on the analysis of factors affecting construction sequence and timing data of existing URT lines. The model comprises construction sequence and timing sub-models, using an improved TOPSIS with Rough Set method and Logistic-β method, respectively. The model is verified using Chengdu rail transit network as a case study, demonstrating its effectiveness in providing quantitative support for URT network construction schedule planning

Long Chen-(2022) Construction delays are a major problem in infrastructure projects, particularly as risks become more interconnected and occur in a chain of cascading events. However, existing research has overlooked the interdependency between the sequence of risk occurrence. This study proposes a novel approach based on Bayesian-driven Monte Carlo simulation for managing interdependent construction schedule risks of infrastructure under uncertainty. The approach integrates hybrid data processing and analytics methods to construct a Bayesian network for identifying risks and their interdependencies, conduct risk inference and construction duration prediction, and identify critical and sensitive risks for risk mitigation. The approach is verified through a real infrastructure project, demonstrating its accuracy in schedule prediction, effectiveness in proposing risk mitigation strategies, and convenience in data acquisition and processing. The study contributes to understanding the interdependencies of risks and their impacts on construction schedule, offering a beneficial approach to managing construction schedule risks of infrastructure under uncertainty.

Zhiliang Ma (2021) This study focuses on the optimization of component-level construction schedules for Hybrid Concrete (HC) structures, which involve both precast (PC) components and cast-in-situ (CiS) components being constructed in parallel. The authors propose an optimization model for the resource-constrained project scheduling problem for HC structures, with the objectives of minimizing construction makespan and cost. To solve the model, a multi-objective discrete symbiotic organisms search (MODSOS) is developed to obtain non-dominated solutions.. The study suggests future improvements by using artificial intelligence methods for estimating construction durations and integrating Building Information Modeling to automate data extraction.

Vahid Faghihi (2020) This paper discusses the importance of project schedules in the construction industry and the challenges in developing them. It also highlights the potential of Building Information Modeling (BIM) and the concept of structurally stable sequencing to generate practical construction sequencing. The authors propose a computer application that uses the Genetic Algorithm (GA) to automatically derive a structurally stable construction sequence from the BIM of a project. The proposed methodology is validated through 21 experiments, which successfully generated stable construction schedules. The use of GA as an expert system tool offers a novel approach to construction project management.

Hamad Al Jassmi-(2022) It is common for a construction schedule to deviate from its original planned baseline, as uncertainty is inherent in all construction activities. Accordingly, planners are required to perform periodic schedule updates that learn from retrospective progress to more accurately schedule remaining activities and draw optimum recovery plans.. In essence, this research provides a platform towards an automated self-recovering schedule system,

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which serves construction managers in proactively preventing potential schedule deficiencies.

Ibrahim Bakry(2012) Construction Schedule Acceleration (CSA) can affect not just the time but many other project aspects. During a CSA, there can be many impacts having significant effects on the project value. Previous studies have highlighted the importance of considering quality, productivity and functionality at a CSA along with cost and time. The aim of this research is, therefore, to investigate how value can be optimised during a CSA process. A qualitative research approach was adopted. Altogether, ten semi-structured interviews were conducted. The interview data were transcribed and analysed using a manually performed content analysis. This study has revealed types of CSA based on the purpose (delay minimising purpose or non-delay minimising purpose) and the party who initiates it. Cost, quality, functionality, productivity and profitability were identified as main value considerations during a CSA other than time. Applicability of value management (VM) job plan stages and Earned Value Management (EVM) indicators during different CSA stages to optimise value were also found. Finally, these findings were mapped in a framework to show how VM and EVM concepts could be used in enhancing value during a CSA. The framework conceptualises the relationship between "value" and CSA and how it varies upon distinct parties of a construction project during different stages and types of CSA. The proposed framework can be used as a guidance for optimising the value during the stages of a CSA.

Jaehyun Park-(2012) Building information modelling (BIM) has recently experienced rapid technological advancement and gained prevalence in the architectural, engineering, and construction (AEC) industry. BIM models contain valuable information on buildings to support four-dimensional (4D) modelling that involves the integration of three-dimensional (3D) building components and time as specified in the one-dimensional (1D) construction schedule. While 4D modelling has been proven to be useful in effective construction management, a critical challenge in current 4D modelling practice is the discrepancy between the element breakdown structure (EBS) of the BIM model and the work breakdown structure (WBS) of scheduling. This discrepancy leads to considerable time and effort being spent on matching and linking BIM model components and schedule activities. This paper presents a framework for automating the generation of construction schedules during the BIM model creation process. A matching and pairing mechanism between EBS and WBS was created to automate the matching and linking between BIM model elements and construction schedule activities. A prototype system was developed and tested to validate this framework. The proposed framework is expected to automatically generate detailed construction schedules during the development process of BIM models.

Shin, Dongwoo(1988) Construction schedule analysis is a very broad and complex problem in that it requires a variety of data and problem-solving procedures which are poorly defined by uniform methods. Such an analysis for projects in the design process is even more difficult because much of the detailed design information is unknown, and time-consuming efforts for manual data processing are repeatedly required as the design information grows and changes.. The implementation study also confirms that the model is able to operate as it is designed by utilizing existing technical tools. After reviewing the study, overall conclusions are drawn, strategies for developing the actual model are recommended, and areas for further research are identified.

Yuxian Zhang-(2022) Drilling and blasting is the most flexible tunnel construction method considering the excavation of tunnel size and shape. Schedule and safety are two critical issues for project stakeholders during construction. To evaluate construction quality, various tools such as Building Information Modelling (BIM), schedule simulation, and numerical analysis are commonly employed. However, in current practices, these processes are often independent of each other, requiring data conversion and operation between multiple platforms. In this paper, we present a novel integrated framework for improving the safety and efficiency of hydraulic tunnel construction. To this end, a geometric tunnel model with time attribute is created, which connects the schedule information obtained by construction simulation via secondary development.

Jongsik Yoon-(2022) Determining a reasonable construction time (RCT) is crucial in project planning and schedule management. Construction projects are exposed to the external environment, including rainfall, extreme temperatures, snowfall, and high wind speed, and the RCT should be evaluated considering these risks. The risks can be reflected by activity duration using nonworking days (NWDs). However, current construction planning and scheduling practices are ineffective for dealing with of NWD characteristics because working days (WDs) and NWDs are mixed in most schedule performance data used for schedule development. Activity durations estimated using historical performance

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data may not appropriately reflect the activity characteristics (work type, region, and work timing), leading to an unreasonable construction time for a projectThe ADSM suggests an integrated framework for combining activity characteristics and project environmental conditions when determining NWDs of each activity. The ADSM can be used by project owners for determining the RCT or the contract time, which varies according to activity characteristics. Also, a construction scheduler can assess to what extent the construction schedule will be influenced by NWDs.

Long Chen-(2020) The construction of infrastructures is becoming increasingly complex and risky under uncertainty, which often results in construction delay. Many efforts have been made to identify and control construction schedule risks. However, previous efforts only focused on the diversity of risks with assumption that risks are independent. The ignorance of (1) interdependencies between the originalities of risks within infrastructures as a sociotechnical system, and (2) links between risks impedes the reasonable explanation for and assessment of the construction delay of infrastructures. This paper aims to develop a novel hybrid approach to address these issues based on dialectical systems and network theory. It first identified construction schedule risks from the perspective of dialectical systems at the industry level, which were further verified by global expert interviews and refined by questionnaire survey based on the Chinese infrastructure industry.

Hesong Hu-(2019) The site construction management of traditional filling pile has some disadvantages such as redundancy of data, difficulty in finding data, low working efficiency and poor timeliness. Thus, combined with the actual needs of filling pile construction management, based on the Java language, the mobile phone client of filling pile construction information management system was developed, and the mobile client system framework, operating process and functional framework were designed and illustrated. The software provided an advanced management method for the filling pile construction, it had great value to guarantee the construction progress and improve the information level of construction management.

Matthias Hamm-(2011) The efficient execution of complex construction projects requires comprehensive construction scheduling. It is necessary to consider various dependencies and restrictions as well as the availability of required resources. The generation of efficient schedules is a very challenging task, which results in a NP- hard optimization problem. In this paper an approach is presented to determine efficient construction schedules by linking discrete-event simulation with an optimization framework. This enables the application of various metaheuristics to the scheduling problem. Thus, efficient schedules for complex construction scheduling problems can be determined in a relatively short amount of time. An example of implementation is presented to validate the optimization concept using Evolutionary Algorithms.

Jianwei Lu –(2020) Complex geological conditions and information gaps often necessitate design alterations during tunnel construction. The alteration of rock mass classifications makes it especially difficult to control the construction schedule and cost. Considering the effects of the alteration of surrounding rock classifications on the construction period and cost, a Monte Carlo Simulation-based model was established by using the alteration probability of each rock mass classification, construction time, and cost per linear meter as random variables. Through the empirical study of a double-track tunnel, the practicability and feasibility of the model was verified, and a new method is provided for reasonably determining and assessing the construction schedule and cost of a tunnel

Wang Xing-xia-(2009) This paper describes a risk analysis method dividing project construction period into several major phases and each phase into several time spans based on the construction schedule and project features. By calculating the risk degree of construction items and allocating them to each phase and time span, we obtain three indicators, i. e. overall risk degree, average risk degree, and key projects, for each phase and time span to control the risk characteristics of the project. Example analysis shows that the method is effective and feasible

Ningshuang Zeng-(2015) Providing accurate, complete and real-time supply and logistics information for construction schedule control is a significant issue in construction management. This paper aims to design a holistic control model for BIM-oriented CSC (Construction Supply Chain). First, this paper analyzes the information requirement of different supply nodes and presents the strategies of lead time management influenced by uncertainty based on CODP (Customer Order Decoupling Point) classification thinking. In the next stage of the study, efforts are made to integrate

S Meeampol-(2006) The purpose of this study is to determine whether there is a correlation between mobilization costs and project schedule performance of highway projects. In addition to this, the study will also determine if the mobilization costs are helping small or large highway projects in terms of improving the schedule performance.

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Design/methodology/approach: The data of 206 highway projects were collected from the Department of Transportation of two states with the help of questionnaire survey. The cost, schedule and mobilization costs data were collected. The performance metrics related to construction schedule growth and construction intensity were developed in order to test the research hypotheses: mobilization costs will increase the schedule performance of highway projects. The data were also divided into two groups based on project cost and analyzed to check whether the mobilization costs impact the schedule performance of these highway projects. This paper contributes to the existing body of knowledge by validating the impact of mobilization costs on the schedule performance of highway projects. There has been no empirical study conducted prior to this to identify the role of mobilization costs on reducing the schedule growth of highway projects

Wilfredo Torres-Calderon-(2019) Over the past two decades, hundreds of studies have been published that demonstrate the benefits of 4D building information modeling (BIM) for optimizing construction planning and scheduling. Nonetheless to date, 4D BIM has only been adopted by 35–40% of top engineering news-record (ENR) companies and only used on a small fraction of their projects. The longevity of using 4D BIM also rarely outlasts the pre-construction phase. While the value associated with using 4D BIMs during the construction phase is well documented, the level of effort required to create them has significantly impacted perceptions about their return of investment (ROI) and limited their adoption.

Sang Jun Ahn-(2022) In off-site construction, finding good synchronization between the factory and the construction site is critically important. However, in practice, on- and off-site operations are typically scheduled separately, without considering their performance at the project level. For the planning of logistics operations that bridge a factory and sites, this paper proposes a framework to optimize the truck-dispatching schedule using a discrete-event simulation model built based on real fleet operational data (e.g., GPS). Independently pre-planned schedules of factory and site operations are used as inputs, and historical data from transportation equipment are leveraged to generate the dispatching schedule. According to actual panelized residential projects, the proposed framework resulted in approximately 90% of deliveries being made on time, and daily activities were completed on average 40 min earlier than the historical time. Thus, the optimization of on- and off-site schedules may reduce the delays and under-utilization of equipment.

Zinababuwarda Mohamed-(2019) Fast-tracking is an important process to speed the delivery of construction projects. To support optimum fast-tracking decisions, this paper introduces a generic schedule optimization framework that integrates four schedule acceleration dimensions: linear activity crashing; discrete activity modes of execution; alternative network paths; and flexible activity overlapping. Because excessive schedule compression can lead to space congestion and overstressed workers, the optimization formulation uses specific variables and constraints to prevent simultaneous use of overlapping and crashing at the same activity segment.

Amal Bakchan-(2018) The large proportions of waste generated from the construction industry have led to adverse environmental and economic impacts. Consequentially, there is a need for effective construction waste management (CWM) at construction sites. This study seeks to define Building Information Modeling (BIM) dimensions and respective conceptual interactions that shape the integration of CWM with construction management. A multi-dimensional framework is proposed that leverages BIM-based automated construction waste (CW) estimation capabilities to provide guidance on CWM applications, specifically, CW disposal scheduling, disposal cost estimation, onsite reuse, and allocation of waste bins. The framework presents interactions between these CWM applications and construction management fields—scheduling, estimation, sustainability, and site planning—to enable a strategic alignment between conventional project objectives and CWM

J Wang, S Zeng, J Ju - Tongji DaxueXuebao,(2017) The paper "Construction Schedule Management Using Resource-Constrained Project Scheduling Model" proposes a resource-constrained project scheduling (RCPS) model for managing construction schedules. The authors argue that traditional scheduling methods often fail to account for resource constraints and can result in delays and cost overruns.The RCPS model is designed to address these issues by considering the availability of resources and the dependencies between activities in a construction project. The model uses mathematical algorithms to optimize the schedule based on resource allocation, activity sequencing, and duration

L Chen, Q Lu, D Han - Expert Systems with Applications, (2023) – Elsevier The paper "Construction Schedule Management Using Resource-Constrained Project Scheduling Model" proposes a resource-constrained project

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N Essam, L Khodeir, F Fathy - Ain Shams Engineering Journal, (2023) – Elsevie The paper "Approaches for BIM-based multi-objective optimization in construction scheduling" discusses the use of Building Information Modeling (BIM) in multi-objective optimization for construction scheduling. The authors argue that traditional construction scheduling methods often fail to consider multiple objectives, such as time, cost, and resource utilization, and can result in suboptimal solutions.The paper reviews different approaches for BIM-based multi-objective optimization in construction scheduling, including evolutionary algorithms, fuzzy logic, and game theory. The authors also provide a case study of a commercial building project to demonstrate the effectiveness of the multi-objective optimization approach.

MN Omidvar, X Li, X Yao - IEEE congress on evolutionary,(2010) The paper "Cooperative Co-evolution with Delta Grouping for Large Scale Non-Separable Function Optimization" proposes a novel cooperative co-evolution (CC) approach for solving large-scale non-separable function optimization problems. The authors argue that traditional optimization methods often fail to scale up to large problem sizes and can result in suboptimal solutions.The CC approach is designed to address these issues by decomposing the problem into smaller sub-problems and solving them in parallel through a cooperative co-evolutionary process. The authors introduce a new delta grouping mechanism that allows for the efficient grouping of variables and the distribution of sub-problems to subpopulations. The approach also incorporates a memory mechanism to retain useful information and guide the search process.

MN Omidvar, X Li, Z Yang, X Yao ,(2010) The Cooperative Co-evolution for Large-Scale Optimization through More Frequent Random Grouping is a research paper that proposes a modified cooperative co-evolution algorithm for solving large-scale optimization problems.The authors argue that traditional cooperative co-evolution algorithms can become inefficient for solving large-scale problems due to the difficulty of partitioning the problem into subcomponents. To address this, the authors propose a modified cooperative co-evolution algorithm that increases the frequency of random grouping of subcomponents.The proposed algorithm, called the Frequent Random Grouping Cooperative Co-evolution (FRG-CCE), utilizes a combination of deterministic and random grouping strategies to improve the efficiency of the optimization process. The authors also propose a new fitness sharing scheme that promotes diversity within the population

D Karaboga, B Basturk - Journal of global optimization, 2007 The paper "Cooperative Co-evolution with Delta Grouping for Large Scale Non-Separable Function Optimization" proposes a novel cooperative co-evolution (CC) approach for solving large-scale non-separable function optimization problems. The authors argue that traditional optimization methods often fail to scale up to large problem sizes and can result in suboptimal solutions. The CC approach is designed to address these issues by decomposing the problem into smaller sub-problems and solving them in parallel through a cooperative co-evolutionary process. The authors introduce a new delta grouping mechanism that allows for the efficient grouping of variables and the distribution of sub-problems to subpopulations. The approach also incorporates a memory mechanism to retain useful information and guide the search process

MN Omidvar, X Li, Y Mei, X Yao -The paper "Cooperative Co-Evolution With Differential Grouping for Large Scale Optimization" proposes a cooperative co-evolutionary algorithm for solving large-scale optimization problems. The authors argue that traditional optimization methods often face difficulties in scaling up to large problem sizes and can result in suboptimal solutions.The proposed algorithm is based on cooperative co-evolution, where the problem is decomposed into smaller sub-problems that are solved in parallel. The authors introduce a differential grouping mechanism that allows for the efficient grouping of variables based on their correlation and distribution of sub-problems to subpopulations. The approach also incorporates a memory mechanism to retain useful information and guide the search process.The paper provides a detailed explanation of the algorithm, including its input and output data requirements, algorithmic approach, and sensitivity analysis. The authors also demonstrate the effectiveness of the approach through experiments on benchmark functions.

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MN Omidvar, X Li, Y Mei, X Yao ,The paper "Sustainable Green Construction Management: Schedule Performance and Improvement" discusses the importance of incorporating sustainability principles in construction management, particularly in relation to schedule performance and improvement. The authors argue that traditional construction management approaches often fail to consider the environmental impact of construction projects, leading to negative consequences for both the environment and project performance. The paper reviews the key principles of sustainable construction management and provides a case study of a green building project to demonstrate how these principles can be implemented in practice. The authors highlight the importance of effective communication, stakeholder engagement, and collaboration among project team members in achieving sustainable construction management goals. The paper also discusses various approaches for improving schedule performance in sustainable construction management, including the use of Building Information Modeling (BIM) and Lean Construction methodologies. The authors suggest that these approaches can help improve project efficiency, reduce waste, and promote sustainable construction practices.

VI. CONCLUSION

The literature review is a critical evaluation and synthesis of existing research and scholarly literature on a particular topic. It involves a thorough examination of relevant publications, such as academic articles, books, and other sources, in order to identify key themes, debates, and gaps in knowledge. A construction project which involves multiple contractors will always slip away and delay from the project master schedule because of lack of communication and mismanagement of schedule to avoid this problem various studies have been followed but the results are not positive so in this a new method of framework is going to be analyzed. The framework is based on a method of Hybrid cooperation coevolution algorithm based on the algorithm in this we rank the constraints that affect the project schedule by analysing the survey results and then the framework will be formed according to the constraints to improve the schedule process. we can subdivide the schedule and daily task allotment so that the planned schedule will not slip away. The future work of this project may find a new solution for the schedule for large scale projects

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