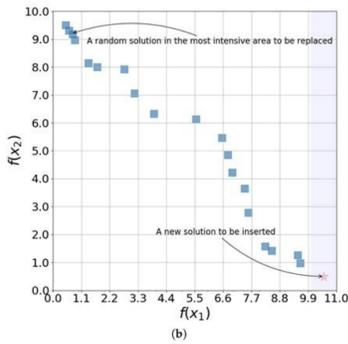
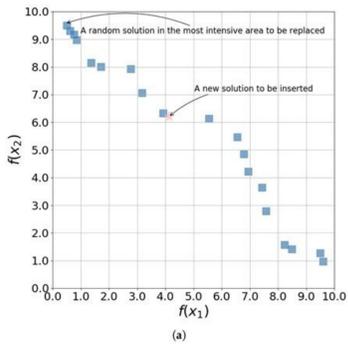


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In this paper, scheduling problems with fuzzy due dates and fuzzy processing times are investigated by using the concepts of possibility and necessity measures that were developed in fuzzy set theory. Many types of objective functions will be taken into account through the different combinations of possibility and necessity measures. The purpose of this paper is to obtain the optimal schedules based on these objective functions. The genetic algorithm will be invoked to tackle these objective functions. Three numerical examples are also provided and solved by using the commercial software MATLAB.

**Keywords:** Fuzzy numbers; Earliness and Tardiness; Fuzzy due date; Fuzzy processing time; Possibility Measure; Necessity Measure.



# USING GENETIC ALGORITHMS TO SOLVE FUZZY FLOW SHOP SCHEDULING PROBLEMS BASED ON POSSIBILITY AND NECESSITY MEASURES

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### Abstract

The scheduling problems with fuzzy processing times and fuzzy due dates are investigated in this paper. The concepts of earliness and tardiness are interpreted by using the concepts of possibility and necessity measures that were developed in fuzzy set theory. Many types of objective functions will be taken into account through the different combinations of possibility and necessity measures. The purpose of this paper is to obtain the optimal schedules based on these objective functions. The genetic algorithm will be invoked to tackle these objective functions. Three numerical examples are also provided and solved by using the commercial software MATLAB.

**Keywords:** Fuzzy numbers; Earliness and Tardiness; Fuzzy due date; Fuzzy processing time; Possibility Measure; Necessity Measure.

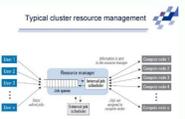
## 1 Introduction

The concept of fuzzy set was proposed by Zadeh [20]. The application of employing fuzzy sets theory to the topic of scheduling problems have been widely studied under the different assumptions of fuzziness. For example, the collection of articles edited by Slowinski and Hapke [19] gave a main stream of this topic. For more details on the topic of fuzzy sets theory, we may refer to [10], [15] and [29].

In the real world, it will be more reasonable to model a problem with concern both in randomness and fuzziness. The randomness occurring in scheduling problems is categorized as stochastic scheduling problems (ref. Pinedo [16]), and the fuzziness occurring in scheduling problems is recognized as the so-called fuzzy scheduling problems (ref. Slowinski and Hapke [19]). The fusion of randomness and fuzziness in scheduling problems may refer to Itoh and Ishii [3].

For the real problems, the data sometimes cannot be recorded or collected precisely under some unexpected situations. For instance, the processing time of a job sometimes cannot be measured precisely. Maybe, the more reasonable statement is that "the processing time is around 3 hours".

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Philippines (and other western cultures) refuse this time of time. ^ Benitez, Christian Jil (2020). ^ Josh Macabug. Rappler. HuffingtonPost.com. Business, but it can also destroy good relationships. Kung Hindi Ang Kaniyang Pagkahuli Sa Kabala ng Marahil Kawalan Ng Mga Katulad on Mapag-Antalang Pagkakataon. Look for the delay in Wikionâ ourselves, the free dictionary. Recovered 2014-01 . This had also convinced the local population to want what its Western colleagues want. Cultural tendency perceived in relation to a more relaxed attitude towards the time between Africans, both, both in âfrica as abroad. GS and events, [8], but also includes the quieter, relaxed and less rigorous lifestyle found in African paranes, especially in opposition to the rhythm most linked to relief of everyday life in the western mat. [9] cp the time (of "POV team the color ") is an American expression dated similar to an Afro-American stereotype as often late. [10] [11] [12] [13] "Fiji Time" is a local saying in Fiji to consult the island's delay and slow pace [14] and the term is widely used by companies Focused on tourists, both advertising and products and remembrances. [Necessary quotes] "Filipino Times" refers to the habitual perceived delay of Philippines. [15] It is similar to such similarities with "African time" and "CP time" and the term is usually used in a pejorative sense as one of the defining negative bars of the Philippine. [16] Filipino Josâ f M. For the surname, see Tardy (surname). THE personality traction is punctuality. (By relating delay with power, it is necessary to emphasize the deliberation at work, as it is only through the intentionality that this delay can be powerful. Table pointed out that the widespread acceptance of the "Philippine Time" as one of the characteristics that defines the Philippine is an example of the successful internalization of the negative image of the Philippines, as perceived by the colonizers Spain and American [17] He argued that the persistence of this colonial self-image among the Philippines contributed to the weakening of their corporate cultural self and the mangle of their growth, as it forced many Philippines to reject and be ashamed of their identity. [18] He also noted that a local time was surprised to discover that many of the relative writings of Filippine self-identity focused mainly on negative and derogatory betrayals such as "Philippine Time", Whic H is an evidence of apparent propensity of the Philippines for self-flag. [19] Some sources identify the origins of Filipino's lack of punctuality in the Spanish colonial periode, for arriving late was considered a sign of status in that time, as portrayed in a scene in chapter 22 of Josâ's novel Elibusterism. By imposing western cultural patterns (such as "time") to Philippines and other western cultures and, therefore, as a successful tool of national resistance. [23] In some cases, however, this delay can be deliberately used as a form of power display. [24] The 1976 national artist from the Philippines for Nick Joaquin literature challenged the narrative of Spanish colonial stuffs of "Filipino Instead, identifying its origins in the practical culture of timelessness before the introduction of the "foreign tyrant" during the Spanish era and, therefore, local resistance against the transactions of society without relief. PRINTIALIAL FOR THE RELATE TAX TO THE BASED FRONT- CULTURE. [25] Another related term is the "morning hub" (Philippino: Kaugaliang Maâ È ± Ana; Â AO; Mamaya na (later). [26] Mai Â ± Ana's attitude: the negligent attitude toward time also attributed to southern local [27] and procrastination is described by euphemism "ma A ± Ana!". Which literally means "tomorrow", but as a joke, it is anytime between tomorrow and never". [28] [29] In the 2007 Marion, the Peruvian government announced the campaign, "La Hora Sin takes" or "time without delay" to combat the known delay in Pais as "Peruvian Time" or "Peruvian Time". NPR. In the psychological categories we used earlier, the Philippines internalized the image their colonial masters had of them, an image that continues to weaken their corporate cultural self and undermine their growth. Recovered 2014-03-16. ISSN 0091-8296. The New York Times. Sa ... ^ "fiji time, is not important to laugh" the Philippine moving in 6 of 2008 ed. Rex Bookstore, Inc. 22 (1): 51. recovered 2022-02-17. 2010-02-23. "Characteristics of the speech of a group of Filippine Electrical Discussion". Mother. 2017-03-27. ^ "Can âfrica maintain time?". MAVERICK DIARARY. ^ Tan, Brian (September 23, 2017). A frightening aspect of this reality is that this enemy is literally inside; resides in their minds. Sa Ibang Salita. Ang Pagkahuli Ay Naaari Lang Bilang Manipesyon Ng Kapangyarihan Ng Isa Sa Abot ng Kaniyang Pagnannais for Gayong Pagkahuli: Hindi Ito Just Pagkahuling Dulot Ng Pagkakaipit Ng Isa Sa Kung Anong Expected opportunity ... A "Producer" Tries to to to As far as possible in time and, as a result, has difficulties with very tight hours. The hood of arriving late or delaying the arrival of the delay in the programming, see the delay (appointment). Culture and history. a "distracted teacher". ^ Nikki Lynette (2009-12-03). Referenses of References (Scheduling) of the Time of Procrastation Time (Tardy ), dictionary entrances ^ a b C MA Conduct Mc 15 "Department of Califon Employment Development ^ Diana delonzon; never late Again: 7 Cures for the Punctual Challenge, 2003. ISBN 0971649995 ^ "Seven Types of Delayed People." The Herald News ^ "For the chronically backwards, is not a Foraâ, The New York Times ^ "What is this thing called African time?"; 2010-01-21. A "ion" has little self-control. Tuttle publishing. (April 1, 1998). Rex Book Store. Inc. Recovered 013-2013. These foreign impressions of the Philippines continue to haunt us in the way we imagine ourselves through negative characteristics such as "mana and habit" (usual procrastation) "Filipino Time" and "ningas kugon" (Starting, but never completing tasks) (Enriquez, 1992, p.72). Gar late? Missionology. ^ Lacamilao, Pauline (October 17, 2017). Katipunan. "The price can be high ", by Kristin Dizon, reprimanding from Seattle Post-Intelligencer, November 17, 2003 (recovered on the 25th of Baby 2016) ^ Guide of an expatrians for the concept of time of amion Rica Latina ", The Wall Street Journal, September 6, 2016 ^ "Peru asks the citizens that they end up with the late back; "Star News Online, February 22, 2007 ^ O Peru, Lanhaço do campaign Against the delay ^ "A gringo in Manana-Land 1924" ^ "Histories of Mai Â ± Ana Land". Digitized, Congress Library ^ "Desa Standard Time "Withdrawal Https://h. Wikipedia.org/me /drex.php?title=tardinessSSSS ID = 1082931104 "" "Evader" puts a higher priority to his own needs in comparison over time. BBC Notion. P. 66. If the Philippines apparently are their most severe crystal practices, could this be the self-flagging of the colonized mind at work? "Why the Philippines follow the Philippine Time." From an equivalent point of view today, we can explain, say, "Philippine Time" as a quality that remains of the "timelessness" of our ancient culture and as a stubborn resistance against the advent of the foreign tyrant, and as a sign of the effort The cost to readjust the time without relief to the clock time; But to identify the problem with a feeling - this, Bah, is not changed by the relief - it would not be proud, but prejudice and coarsely simplistic. (December 14, 2015). It became a force that militates against its well-being; It became an enemy that they need to overcome. | Become Nikki Lynette. ^ "For some, the Philippine time means to arrive a few minutes or an hour after the designated time for a program, party, field trip, meet or any celebration." Chapter 30 - Filipino Time. ^ Philippine, Philippine, DiNSPORA and a containing search for identity. In vain agreements, such as workplace, school, etc. (1994). P. 12. Tags Guide to Philippines: Know the rules that make the difference? "El Filibusterism". But its delay, despite the absence of a similar impediment meeting. Sterene. Foster; [32] or History of Mai Â ± Ana Land (1922) [33] in May Carr Hanley. Other Referring to a loose attitude towards the time includes "time Hawaiian" and "time of the island", [27], as well as "Desa Standard Time" [34] and "NDN Time". ^ Aguilâ, DISH N. Although the Americans coin the term during their military occupation of the Philippines in the Upon XX, the phenomenon dates back to Spanish colonization (which lasted from 1521 to 1898) . 2013-08-09. The Telegraph DIARPH. Jstor 29792143. Binding the prison and power, it is important to emphasize the functioning of Theckle, because it is only in accordance with this intention that the power of this prison is power. One of the most zealous answers framed the tathopian in a nationalist structure. Ionating the concept of "Philippine" saying "if there was ever a unsuccessful case of imposing the Western ... Edjiâo f c.n.com. " Adjusting to the time of âfrica - CNN.com [2] If the delay is less or without interfeer in the employer's operations, it should not be legally considered as conduct. People in 7 categories: [31][4] [5] A "rationalizer" insists on blaming circumstances rather than recognizing the responsibility for delay. DOI: 10.1177/009182969802600208. 26 (2): 195. RET RIIED 2008-02-18. Recovered 2008-02-18. ^ Posej, Joy (2011). The hood of arriving late to the former President of Peru, Alejandro Toledo was known as "Cabana Time" after his place of birth. [30] It was coined, "ma zealand", and used in the vain tatulos, for example, Mai Analand (2020) by Pam Muâ È oz Ryan, the gringo in ma Â ± Anand (1995) [31] by Deede Halleck, Ma Â ± Analand; Aventing with Câ e meras and rifle for the Califmon in the Mother (1928) by John Cudahy, a gringo in Ma Â ± Ana-Land (1924) by Harry L. 26 (2): 191-200. OCLC 1043947726. ^ of Table, Josâ M. ISBN 9789712714276. "Tardy" redirects here. A "Deadline" likes adrenaline during attempts to beat the Target team. ^

