

Optimizing the Liver/Kidney Organ Donation Waiting List in Antalya Using Maxsat and Graph Model

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Abstract

Organ transplantation has become an increasing need in the world and in our country. Organ transplantation is completed by taking healthy and matched organs from living or cadaver donors and transplanting them to the recipient. Different approaches are sought for solutions to the organ transplant waiting list and matching problem in the world and in Turkey. The number of people waiting for organs is many times higher than the number of organ donors, and the difference is increasing every year. In this project, we research and learn all the details of the organ transplantation system in Turkey, in particular the computer network where the organ waiting list and matching is processed, coordinated locally at Akdeniz University Prof. Dr. Tuncer KARPUZOĞLU organ transplantation center with the help of its coordinator and Lecturer Nilgün Bilal. We work to identify problems and improve the system when applicable. We apply a new optimization method (MaxSAT method) to the organ waiting list and organ donation matching problem, on which second author worked with Researcher Felip Manyà (UAB-III/CSIC- Spain) at the university in Spain on her Erasmus internship. Alternatively, we also consider approaching the problem using other industrial engineering techniques such as stochastic modeling. We then compare the results in different techniques to improve the system.

Keywords

Organ transplantation, waiting list optimization, MaxSAT, Scheduling method

Biographies

Assoc. Prof. Semai Ülgen is the chair of Industrial Engineering Department at Antalya Bilim University where she has been on the faculty since 2012. She received Ph.D. degree in Mathematics at Purdue University in 2005, and B.S. degree at Bilkent University in 1995. In years 2004-2006 she was at University of Mississippi, Oxford, MS as an assistant professor. Then she worked at Grand Valley State University, Allendale, MI, as an assistant professor for one year in 2006 and later she worked as an assistant professor at Northwestern University for three years starting in 2007. She held visiting assistant professor position at Indiana University, Bloomington, IN as an assistant professor for one year in 2011-2012. Dr. Ülgen was a recipient of the Young Scientist Award for Turkish American Scientists and Scholars Association (USA) in 2006. Her research interests are Finsler Geometry; Noncommutative Geometry, Applications to Mathematical Physics. She is also building research interest in stochastic processes and its applications. She was a researcher in TUBITAK 1001 (the Scientific and Technological Research Council of Turkey) research project (#113F311, Title: Einstein metrics in Finsler Geometry) for two years in 2014. She served as the adviser for the Survey Development and Implementation ATSO Pilot Project for Determining the Industrial 4.0 Status of Companies in Antalya in 2017. She was the academic adviser of the TUBITAK Efficiency Challenge Electric

Vehicle Competition for mainly engineering undergraduate students during the years 2016, 2017, and 2020 organized by TUBITAK. Her team built two electric cars (got 25th in the competitions) and attended the competitions.

Elifnaz Yangın is the senior student of Industrial Engineering Department at Antalya Bilim University. She is a executive researcher in TUBITAK 2209-A research project called “Optimizing the Liver/Kidney Organ Donation Waiting List in Antalya Using Maxsat and Graph Model”