# 摘 要

随着互联网和智能手机的飞速发展，每个人都有一个或多个智能终端，每个终端设备都带有各种各样的传感器、发射接收器等，但由于其数量的庞大和分布的广泛，基于群智感知的应用与研究是很多研究者关注的方向。群智感知具有部署灵活经济、感知数据多源异构、覆盖范围广泛和高扩展多功能等优点。由于数据文件资源存储在各个服务器上，智能终端需要去获取资源，每个人的移动数据流量和数据文件的传输速度都是有一定的限度，因此，数据流量的便捷获取和使用以及提高移动终端上数据文件的传输速度是非常重要的。

针对以上问题，本文基于移动设备数据传输的场景和特点，提出了一种结合多用户设备进行数据共享的方案，来提高不同智能设备的移动数据的使用和数据文件传输速度。通过对数据共享场景的分析，研究了一对多匹配和多对多匹配两种数据共享模型。一对多问题可以简化为经典的NP难题，并基于贪婪策略提出了OTM算法。针对多对多数据共享问题，将多对多数据共享的网络连接问题转换为稳定匹配问题，并基于稳定匹配问题（SMP）提出了MTM算法来解决该问题。

同时，针对多用户协同数据传输问题，利用智能移动设备的多个数据传输模块同时传输数据来提高数据传输速度，把一个大文件分成多块，利用多个智能设备分别传输其中的一块。主要研究了两种情况，一种是一个数据请求者和多个数据协同者，另一种是多个数据请求者和多个数据协同者。针对第一种情况，我们采用基于贪心策略的GM算法来解决用户选择问题，对于第二种情况，我们提出了一种基于Kuhn-Munkres（KM）算法的KMI算法来解决用户匹配问题。

大量的仿真结果表明，在数据共享场景中，我们提出的方案相对于以往传统的方案，考虑了匹配差异度，在用户收益率和匹配差异度有着更好的匹配效果。此外，在多用户协同传输中，针对两种不同的场景，对两种协同用户选择策略进行了实验分析，结果表明我们设计的策略在用户平均收益率、数据传输总量、请求失败率以及时间差异度上有较好的性能。

**关键词：**移动数据共享；多用户协作；移动群智感知；稳定匹配问题

# Abstract

With the rapid development of the Internet and smart phones, everyone has one or more smart terminals, and each terminal device comes with a variety of sensors, transmitters, and receivers. Due to their large number and wide distribution, Application and research based on swarm intelligence perception are the focus of many researchers. Group intelligence perception has the advantages of flexible and economical deployment, heterogeneous perception of multiple sources of data, wide coverage, and high expansion and multifunction. Because data file resources are stored on various servers, smart terminals need to obtain resources. Individual mobile data traffic and data file transmission speed have certain limits. Therefore, the convenient acquisition and use of data traffic and the improvement of data on mobile terminals File transfer speed is very important.

In view of the above problems, based on the scenario and characteristics of mobile device data transmission, this paper proposes a data sharing scheme combining multi-user devices to improve the use of mobile data and data file transmission speeds of different smart devices. Through the analysis of data sharing scenarios, two data sharing models of one-to-many matching and many-to-many matching are studied. The one-to-many problem can be reduced to the classic NP problem, and an OTM algorithm is proposed based on the greedy strategy. Aiming at the many-to-many data sharing problem, the many-to-many data sharing problem is transformed into a stable matching problem, and an MTM algorithm is proposed based on the stable matching problem (SMP) to solve the problem.

At the same time, in order to solve the problem of multi-user collaborative data transmission, multiple data transmission modules of smart mobile devices are used to simultaneously transmit data to increase the data transmission speed. A large file is divided into multiple blocks, and multiple smart devices are used to transmit one of them. Two cases are mainly studied, one is a data requester and multiple data collaborators, and the other is multiple data requesters and multiple data collaborators. For the first case, we use the greedy strategy-based GM algorithm to solve the user selection problem. For the second case, we propose a KMI algorithm based on the Kuhn-Munkres (KM) algorithm to solve the user matching problem.

A large number of simulation results show that, in the multi-user data sharing scenario, compared with the traditional schemes in the past, our proposed scheme considers the degree of matching difference, and has a better matching effect in user profitability and matching degree of difference. In addition, in the multi-user collaborative transmission, for two different scenarios, two collaborative user selection strategies are proposed for experimental analysis. The results show that the strategy we designed is based on the average user return rate, the total amount of data transmission, the request failure rate, and There is better performance in time difference.

**Keywords:** Mobile Data Sharing; Multiple Users Collaboration; Mobile Crowdsensing; Stable Matching Proble

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