

Quantitatively comparing urban areas within the 15-minute city paradigm focusing on segregation interacting with United-and-Close

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Abstract—The paper describes **United-and-Close**, a web application that implements a data-driven methodology to analyse the urban areas where services should be accessible within 15 minutes. Network analysis is exploited to estimate service proximity, density, and diversity as well as the connectivity of different urban areas with each other, in order to gather signals of the general resilience or exposure to urban segregation. **United-and-Close** aims to compute a set of city-agnostic metrics that will include user-specified and personalised parameters.

Index Terms—15-minute city, urban mobility, personalisation, segregation

I. INTRODUCTION

Nowadays, more than 50% of the world's population lives in urban areas, with this number expected to increase during the next few decades [4]. The rapid growth of urbanisation has led to numerous challenges, including overcrowding, pollution, and inadequate transportation infrastructure. As cities continue to grow and evolve, it is crucial that urban planners and policymakers prioritise sustainability and resilience in their urban development strategies with the aim of creating more liveable and inclusive environments for their residents.

The 15 minute urban development paradigm is one of the notably innovative approaches that some cities are adopting to address these challenges [3]. This concept focuses on creating neighbourhoods where residents can access all essential services and amenities within a 15-minute walk or bike ride from their homes, reducing the need for cars and promoting a healthier, more sustainable lifestyle. By implementing this approach, cities are supposed to reduce congestion, improve air quality, and enhance the overall quality of life for their residents. Recent years have seen numerous publications evaluating the compliance to the 15-minute paradigm in various

global cities. However, some works raise concerns that creating inclusive access for all demands within a neighbourhood could lead to gentrification and, consequently, to the displacement of lower-income residents [1]. Therefore, rather than promoting socioeconomic and cultural diversity, segregation and inequality could be exacerbated instead of being mitigated.

Furthermore, in order to be inclusive, the 15-minute paradigm has to consider the individual characteristics and requirements of all residents. Indeed, a 15 minute walk can be practicable for a young and able-bodied person, but may not be feasible for older person or for someone with mobility issues or disabilities. Starting from these premises, we developed **United-and-Close**, a web-based interactive visual platform, able to estimate a given city's neighbourhoods segregation altogether with user-specified parameters compliance with the 15-minute paradigm of the same neighbourhoods.

II. METHODOLOGY

United-and-Close is an on going project [2] and we focus on the main concepts behind our idea of the platform in this paper. However a beta version of the platform has already been released ¹ (Figure 1).

A. Data

United-and-Close employs the data available on *Open Street Map* as the one data source for mapping street networks, transportation options, and service and amenities locations. We are aware that OSM is an open source platform that may not always be up-to-date or accurate and suffers from heterogeneous coverage around the world. To address these limitations and enhance the accuracy, we plan to allow users

¹<https://unitedandclose.di.unito.it>

to incorporate their own data (service and amenities locations) in *United-and-Close*.

B. Personalisation

The typical citizen does not exist because each person is unique and has their own individual needs and preferences. Likewise, a unique paradigm which is compliant to the 15-minute city may not be suitable for everyone. Therefore, a 15-minute city may be feasible for a young and able-bodied person, but it may not be for an elderly person or someone with mobility issues or disabilities. *United-and-Close* allows users to measure and to evaluate their own 15-minute city by selecting a home address, the move mode, how much time they are willing to travel to reach a destination, how fast they move, and the services and amenities they need. Users must be able to quickly navigate through the options and choose the services and amenities that best suit their needs in terms of services and amenities, e.g., through a hierarchical list component.

Therefore, the users are allowed to easily compare wider regions by arbitrarily selecting an area or by comparing different neighbourhoods. This feature could provide valuable insights into the surrounding area and helps users to understand the overall characteristics of their chosen location.

C. Metrics

Once services and amenities within the isochrone (the area from which, starting from a given address, each point in that region can be reached at a given velocity and travel time) are displayed on a map, the web application has to display the degree of proximity, density, and diversity in order to evaluate the compliance of the given address to the user-selected 15-minute city. The definitions of proximity, density and diversity is extensively explained in Moreno et. al [3], but how to accurately quantify these urban metrics remains a challenge for researchers and urban planners alike. We propose to calculate *proximity* as the proportion of reachable service and amenity typologies relative to those chosen by the user. Then, the *density* as the percentage of buildings allocated to services and amenities in relation to the total number of buildings (including accommodation facilities) in that location. Finally, the *diversity* as the proportion of various services and amenities typologies compared to the total number of services and facilities in the area.

D. Segregation

United-and-Close is also intended to be used by stakeholder in order to compare the compliance to the 15-minute paradigm in the different zones of a city and in order to identify residential neighbourhoods that are spatially segregated from other parts of the city. Spatial segregation in cities indicates a lack of connection among different zones, potentially insulating certain groups of people from the rest of society. The Infomap [5] community detection algorithm is used to identify natural neighbourhoods based on street networks. This method is city-agnostic and uses the probability flow of random walks to decompose the network into

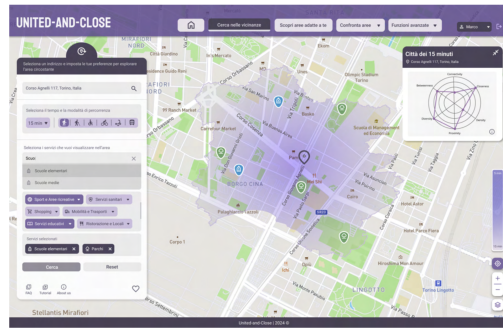


Fig. 1. The services and amenities reachable in the isochrone defined by the user-specific parameters

modules. The approach models the behaviour of a traveller, who randomly traverses streets at intersections.

III. CONCLUSIONS AND FUTURE WORKS

In conclusion, in this paper, we describe the main concepts behind *United-and-Close*, a web application that evaluates the compliance to the 15-minute city using user-specified parameters. *United-and-Close* also aims to warn of the emergence of segregation in a city. Indeed, creating inclusive access for all demands within a neighbourhood, could lead to gentrification and, consequently to segregation. Future plans involve enabling users to add services and amenities to the map to assess compliance with the 15-minute city in a virtual scenario.

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