HACES

Automated, Yet Human-Centric Scheduling for Improved Home Care

Projections of the United Nations' 'World Population Prospects' report show that more than 50% of the people living in Western Europe will be aged 65 or older by 2050. No doubt, with this aging population comes increased pressure on our health care systems.

Home care organizations will play a pivotal role in taking some of that pressure away, enabling elderly people to continue to live a qualitative live in their own homes for as long as possible. Yet, while more – and increasingly complex – care needs to be provided, resources (both in terms of personnel and financial support) are plummeting.

Taking this new reality as a baseline, HACES investigated the development of an automated decision support tool that helps human planners schedule complex home care activities more efficiently; a tool making sure that excellent care can continue to be provided while optimally supporting the caregivers in the field.

Nathalie Roman (Landelijke Thuiszorg) explains: "Scheduling home care support for our clients – in close collaboration with formal and informal care suppliers – and creating the underlying staff rosters is like trying to solve a very complex puzzle. It requires a wide range of ever-varying parameters to be taken into account, ranging from each client's specific care needs and the role of other care suppliers, to the availability of our caregivers. And things become even more complex when last-minute changes occur – such as caregivers suddenly falling ill, new clients that need to be added to the schedule, or a client suddenly requiring hospital care; all while putting the best possible integrated care center stage."

"Today, planning for all of this – and catering for on-the-fly changes – is still largely a manual exercise. Hence, we investigated whether efficiency gains and more and better care can be realized by partially automating this process, leveraging advanced scheduling algorithms that advise our human planners on building close-to-

optimal schedules. The goal was to come to a sustainable care planning solution that brings added value both for the human planners and for organizational KPI decision making."

THE OUTCOMES

1. Extensive user study reveals current scheduling weaknesses and best-practices

At the start of HACES, human planners at consortium partners Gezinszorg Villers, Landelijke Thuiszorg and Thuiszorg Vleminckveld participated in an extensive user study. It not only aimed at mapping current scheduling weaknesses and best-practices, but also tried to propose highly-dynamic scheduling and planning techniques to address some of today's shortcomings. As such, the user study laid the foundation of HACES' optimization algorithms as well as the resulting software tool.

2. HACES' scheduling algorithms allow for fast staff roster updates and important efficiency gains: up to 30% more time can be spent on daily care of – and contact with – clients

The optimization algorithms at the heart of the HACES decision support tool come with increased performance – in terms of computation speed, quality of care and planning.

"Today, accommodating ad hoc changes to staff and client planning can take human planners 30 to 60 minutes a day – depending on the amount and complexity of the changes. Using the newly-developed HACES scheduling algorithms, however, a solution is presented to them in just a couple of minutes," says Pieter Smet (imec - KU Leuven). "One of the main characteristics of our approach is the algorithms' ability to create staff rosters based on smaller tasks (such as 30 minutes of cleaning or 45 minutes of cooking), rather than bigger blocks of two to four

hours. Not only does this better reflect clients' real care needs, the flexibility that comes with such approach has also proven to translate in significant efficiency gains: up to 30% more time can be spent with, and taking care of, clients!"

"Our solution is several steps ahead of existing models. For instance, it can dynamically adjust the duration of a certain task to the amount of time that is available (busy versus less occupied moments). Another unique characteristic are the built-in management functionalities to reach the KPIs set at an organizational level, such as focus on complex target groups, containment of mileage costs, etc. As far as we know, no other general model combines as many complex scheduling, human and healthcare characteristics as the HACES model."

"Uniquely as well, the underlying software goes beyond pure mathematics to also include the human aspect to task scheduling. It does so by providing feedback on how it gets to a certain solution, which was found crucial to making human planners accept the proposed solution," adds Nathalie Roman.

3. Combining the expertise of all HACES project partners in the commercial Plan@SAGA scheduling platform

Project partner Tobania is currently integrating HACES' key insights and technology components in its Plan@SAGA project decision support tool; a tool already used by more than 400 customers to plan their workforce.

NEXT STEPS

"Learning from and inspiring one another is inherent to the unique format of imec.icon projects. Yet, not only did we learn about technical features; perhaps even more importantly we also learned that successful innovation involves letting go of old routines. The HACES project proved that embracing such an open mindset is a key prerequisite to successfully introducing new technologies and methodologies in an organization." – Nathalie Roman.

As mentioned before, Tobania wants to extend its Plan@SAGA scheduling platform with HACES' key learnings – in pursuit of new (international) commercial opportunities with a platform not limited to home care optimization but applicable in a broader healthcare context.

From an academic perspective, the HACES research path is further being explored – with an imec - KU Leuven PhD-student continuing to work on automated home care scheduling.

FACTS

NAME	HACES
OBJECTIVE	Automated, yet human-centric scheduling for improved home care
TECHNOLOGIES USED	metaheuristics; mixed integer programming
TYPE	imec.icon project
DURATION	01/10/2015 – 30/09/2017
PROJECT LEAD	Elsemarie Van De Wauwer, Landelijke Thuiszorg
RESEARCH LEAD	Greet Vanden Berghe, CODeS - imec - KU Leuven
BUDGET	1,880,771 euro
PROJECT PARTNERS	Gezinszorg Villers, Landelijke Thuiszorg, Thuiszorg Vleminckveld, Tobania
IMEC RESEARCH GROUPS	CODeS - KU Leuven, mintlab - KU Leuven

WHAT IS AN
IMEC.ICON PROJECT?

The imec.icon research program equals demand-driven, cooperative research. The driving force behind imec.icon projects are multidisciplinary teams of imec researchers, industry partners and / or social-profit organizations. Together, they lay the foundation of digital solutions which find their way into the product portfolios of the participating partners.

HACES project partners:

The HACES project was co-funded by imec (iMinds), with project support from Agentschap Innoveren & Ondernemen.