Empowering Time Management and Work-Life Balance with TaurusGuard

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Abstract

In the digital age, work-life balance time management challenges have become increasingly critical. Continuous interruptions and information overload in today's connected world lead to high-stress levels and reduced productivity. In this position paper, we present TaurusGuard, a mobile context-aware system of computational fluency to address these challenges, designed to help people manage their time effectively and achieve a better work-life balance. TaurusGuard takes an innovative approach by harnessing contextual analysis and user-defined routines to minimize interruptions between different contexts of life. By selectively presenting notifications aligned with the defined context, the system promotes clear boundaries and separation between contexts, allowing people to focus on relevant activities without unnecessary distractions. The proposed system integrates machine learning algorithms to identify behavioral patterns and routines tailored to each user. The system customizes its functionality by understanding these patterns, adapting time management strategies and notification management to individual needs. Furthermore, TaurusGuard emphasizes human-centered AI, considering ethical implications, explainability of AI-based decisions, and user control over their digital environment. It also addresses privacy concerns by implementing data protection measures. Notifications that may cause interruptions are securely stored in the system's database, organized according to source context, and presented at appropriate intervals to avoid overwhelming the user. By improving time management and work-life balance, TaurusGuard offers users a comprehensive solution to meet the challenges of the digital age. Thanks to its context-aware approach and integration with the principles of computational fluency, the system aims to improve efficiency, productivity, and overall well-being. This research aims at contributing to the discussion on computational fluency in the digital age by demonstrating the potential of TaurusGuard as a tool to help individuals to effectively manage their time, protect their privacy and foster a better work-life balance.

1. Introduction

In the Information and Communications Technology (ICT) era, the increased digital interconnection, also due to the widespread use of digital devices in everyday life, has made people constantly exposed to an incessant flow of information and notifications, generating significant impacts on mental health, productivity and quality of life[1], [2].

Continuous stress from various digital sources can lead to increased stress levels, reduced ability to concentrate and fragmentation of time. These problems have increased especially

during the pandemic with the advent of smart work and education [3]. Our society faces a crucial challenge: *how can we effectively manage the abundance of information and stimuli coming through digital devices in order to preserve our mental health and improve our productivity?*

Moreover, the boundaries between different domains of life, such as work and private life, are becoming increasingly blurred. The traditional concept of work-life balance, i.e., the equilibrium or harmony between an individual's professional/work responsibilities and their personal/family life, which sought to clearly separate time devoted to work from time devoted to personal life, is giving way to a reality in which work is constantly intertwined with the personal sphere. This phenomenon, called work-life blending, refers to the integration or merging of work and personal activities, in which the boundaries between work time and personal time become blurred, presents new challenges in terms of time management, well-being and productivity [1], [2], [4], [5], [6].

This paper aims to address these crucial challenges by presenting the design of a system and the development of TaurusGuard, a mobile application that aims to improve time management, privacy protection, and work-life blending in the digital age. By adopting an approach based on contextual analysis and defining user routines, TaurusGuard offers a customised solution to effectively manage digital interruptions, improve efficiency and preserve individual well-being [7]. Furthermore, this position paper explores how the integration of artificial intelligence, machine learning, and computational fluency principles contribute to the realization of an advanced system for more effective time management and better work-life balance.

2. TaurusGuard: formal models, context analysis and notification control

TaurusGuard's design took into account the model of boundaries between areas of life. This model provides a theoretical framework for understanding the dynamics and interconnections between work and private life, highlighting the importance of managing the boundaries between these two spheres to foster a healthy balance and improved productivity [5], [6].

The boundary model between life areas acknowledges that people have different responsibilities and commitments in different spheres of their lives, such as work, family, and personal interests [1]. Effectively managing these boundaries can help reduce stress and improve quality of life.

TaurusGuard is based on this model to enable users to define and manage boundaries between different areas of their lives. The system allows the creation of specific contexts, such as 'work', 'leisure' or 'family', and associates certain levels of availability, contacts, and applications with each context. This allows users to determine which notifications and interruptions are prioritized in each context and to limit what can be considered unwanted intrusions.

The use of the Boundaries Between Life Areas model represents a step toward more conscious and targeted management of digital time and interactions. By allowing users to define work-life boundaries and customize notifications according to these boundaries the system aims to reduce distractions and improve concentration in different spheres of life [1], [4].

The system adopts a context analysis approach to understand the user's context and to adapt notifications accordingly. Figure 1 presents the interruption model inspiring the design

of TaurusGuard. The system will allow interruptions according to his/her context, domain context, and source of the interruptions. The context analysis process includes collecting data from wearable devices and smart environment systems to obtain relevant information such as geographic location, physical activity level, environmental conditions, and other metrics. The domain acts as a filter for notifications and represents the user's availability level and preferences for the different contexts defined in the system. The user has the ability to manually manage the availability levels, contacts, and applications associated with each domain.
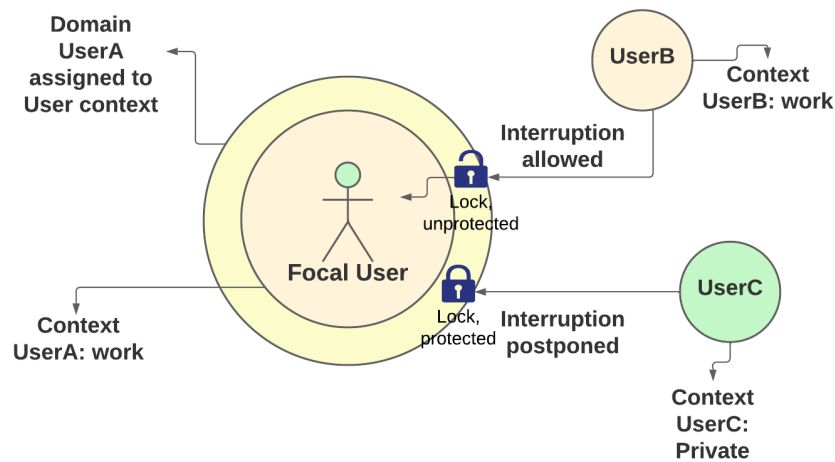
Figure 1: Interruption model

TaurusGuard adopts machine learning algorithms to analyze different notifications considering their context of origin and to classify them smartly. These algorithms identify patterns of user behavior and routines to better understand individual preferences and to adapt the system to the user's specific needs. The technical aspects and challenges associated with implementing notification analysis using machine learning will be presented, together with privacy and data security considerations.

## 3. User context determination and notification classification

One of the main features of TaurusGuard is the ability to manage notifications, reducing distractions and presenting only those relevant to the user based on the defined context. This automatism allows users to focus on prioritized tasks and manage the flow of information more effectively [8]. Machine learning algorithms to analyze several factors in order to determine the relevance of the notification at hand are adopted. First, data from wearable devices such as the user's physical activities, stress levels, and sleep quality are taken into account. This data helps to define the context in which the user is and to determine the level of availability for notifications [5]. The system is designed to leverages integration with smart environment systems to obtain external data, such as traffic information, local events, or weather conditions. This environmental and situational data is taken into account in the context analysis to adapt

notifications accordingly. For example, if the smart environment system detects heavy traffic in a certain area, the system could reduce the frequency of non-essential notifications to avoid further distractions.

Users can also manually define the availability levels, contacts, and applications associated with each domain, by customizing the experience according to their preferences. For example, during work, high availability levels might be set for notifications related to work communications and urgent projects, while during leisure time, less intrusive or personal interest-related notifications might be preferred. Context analysis and domain assignment allow TaurusGuard to filter notifications, presenting only those that are compatible with the user-defined context. This avoids unnecessary distractions and helps create a more focused and productive environment [9]. The system strives to simplify the management of notifications and provide the user with optimal control over interruptions. The combination of machine learning algorithms, integration with smart environment systems and domain definition provides a customized and targeted experience, tailored to the user's specific needs and context.

4. Implementation of TaurusGuard

In Figure 2 the Use-case diagram of the designed system is provided. The main actors (Figure 1) are: **User**, who interacts with the system to (manually) set the domain, define automatic response messages, and provide the context, including location, day, and time; **Wearable**, that is a wearable device providing more precise information about the user's movement speed, blood oxygenation, heart rate (BPM), and stress level; **Smart Environment**, that represents the integration with the smart environments allowing TaurusGuard to dynamically determine if the user should receive notifications, taking into account factors such as driving or traffic congestion.
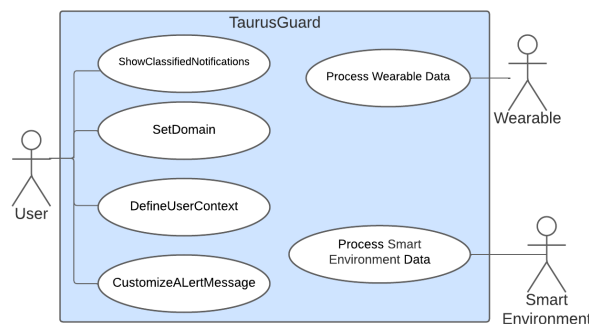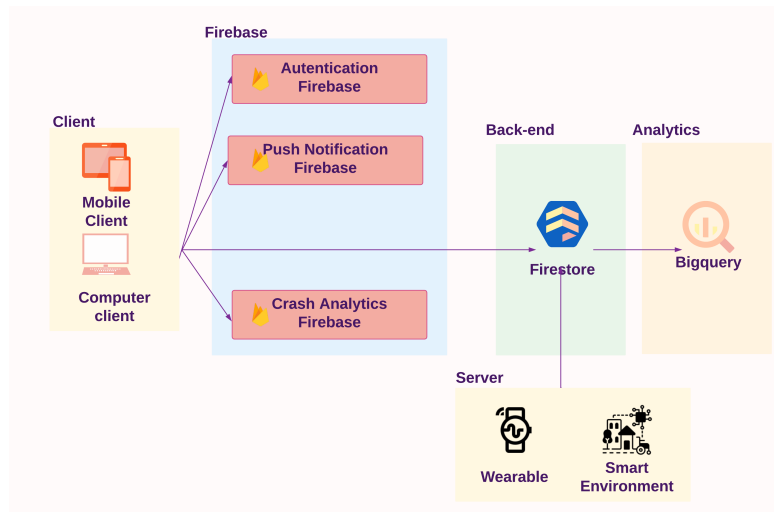

Figure 2: TaurusGuard Use-case diagram

Figure 3, reports the physical distribution of the system, i.e., the deployment diagram. A *Firebase platform* has been adopted that acts as a web server for the application. The *client nodes* represent the individual user devices, such as PCs and smartphones, on which the TaurusGuard application is executed. The *Wearable Device* node represents the wearable devices that interact with the user and provide additional data to the system, such as movement speed, blood

oxygenation, BPM and stress level. The node *smart environment* comprises the sensors and IoT devices present around the user. These devices provide dynamic information, such as traffic, which is used in the context of notification analysis .

Furthermore, the DB node represents Cloud Firestore, a cloud database provided by Firebase, which is used to store and manage system data.


Figure 3: Deployment diagram

5. Enhancing Time Management and Work-Life Balance

The TaurusGuard user interface has been designed with a clean and intuitive layout, focusing on simplicity and ease of use. The main objective is to provide users with a visually appealing and efficient interface that facilitates the customization of notifications, domain settings, and context management [10]. By pursuing a user-centered approach, TaurusGuard aims to enable people to retain control of their digital lives and improve their overall well-being. The notification management interface provides a comprehensive view of incoming notifications, classified by context, priority, and source. Users can customize notification settings for each context, specifying which notifications should be allowed, silenced, or blocked altogether. This level of granularity allows users to prioritize areas of interest, such as work or personal time while minimizing distractions from less relevant notifications.
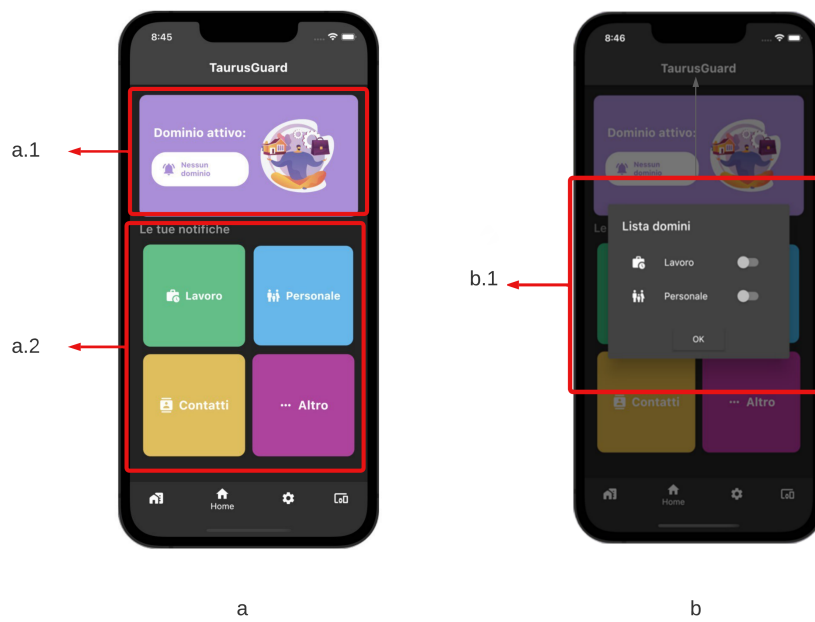
Figure 4: Home page view (a), and available settings for the selected domains (b)
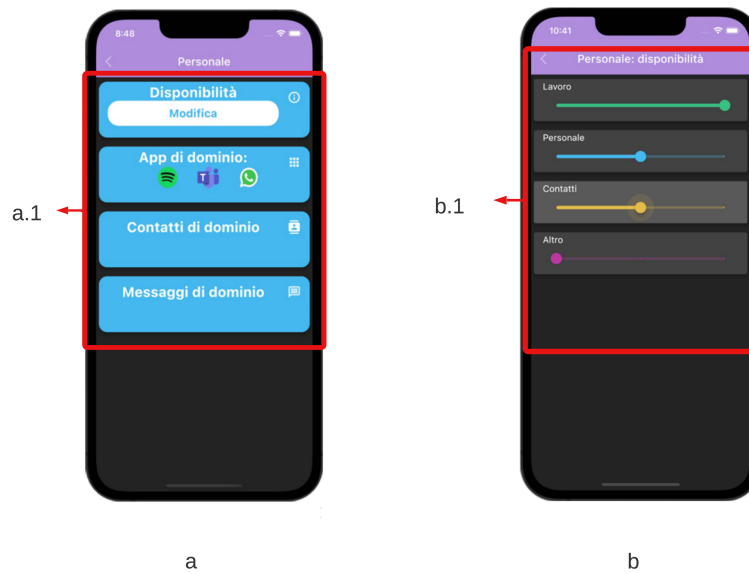
Figure 5: Domain choice (a), and level of availability in the different contexts (b)

The user interface of the mobile application has been implemented in the Italian language. Figure 4a presents the home page of the application. The application can be in different states representing a domain chosen by the user, or automatically assigned by the system based on the context. For example Figure 4, box a.1, shows "No Active Domain"(in Italian "Dominio attivo: Nessun dominio"). Different categories of notifications that the system is able to detect and classify are also shown on the home page: "Lavoro", "Personale", "Contatti", "Altro" (in English "Work", "Personal", "Contacts", "Others" respectively). These categories are differentiated by different colors and icons (see a.2 box in Figure 4a). Figure 5a also shows the section of the application responsible for managing domains availability (a.1 box in the figure). By tapping on the "Dominio attivo" button the user can choose the preferred domain among the available ones, set by himself/herself or proposed by the system (see Figure 4a.1). Figure 5a shows different available settings for the selected active domain: "Disponibilità", "App di dominio", "Contatti di dominio", and "Messaggi di dominio" (in English "Availability", "Domain's app", "Domain's contacts", and "Domain's messages" respectively). On the top of the interface, it is always shown the selected domain. About Availability, the user can set a number of parameters, among "low", "middle", and "high", to set his/her own level of availability in the different contexts "Lavoro", "Personale", "Contatti" and "Altro" (in English "Work", "Personal", "Contacts", "Others" respectively) as shown in Figure 5b.

6. Conclusions

The TaurusGuard application aims at providing a significant step towards enhancing digital fluency and addressing the challenges posed by the ever-increasing influx of digital information and notifications. By offering a comprehensive solution that combines contextual analysis, notification control, and user customization, the system empowers individuals to manage their digital lives more effectively and improve their overall well-being.

TaurusGuard provides users with the tools to define and manage boundaries between different areas of their lives, such as work and personal time, allowing for a more conscious and deliberate approach to digital interactions. By customizing notification settings based on context and individual preferences, users can prioritize their focus areas and reduce distractions, thereby improving their productivity and concentration[1], [10].

The integration of wearable devices and smart environment systems adds another dimension to the digital fluidity achieved through TaurusGuard. A possible integration with healthcare chatbots communicating with the system can enable more effective and personalised communication with users, further improving notification management and providing immediate support in healthcare situations [11].

Educational tools to promote digital well-being and distraction management could be integrated in the future. Through these tools within the application, useful resources could be offered to understand and address problems related to the excessive or unconscious use of digital devices. Users will be able to learn strategies to manage digital interruptions, improve concentration and re-establish a life balance [12], [13].

TaurusGuard not only offers practical solutions for managing digital interruptions and improving productivity but also promotes a more balanced and mindful approach to digital

interactions. By empowering users to define their boundaries, customize their notification settings, and leverage contextual information, TaurusGuard fosters digital fluency and enables individuals to take control of their digital lives [4], [5].

Acknowledgments

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