

GlassAllergy: A Google Glass-based Solution to Empower Patients with Skin Allergies

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Abstract. A variety of substances contained in cosmetic products can lead to allergic reactions for certain individuals. The names of such substances are predominantly printed onto a product in small-sized expert language. For this reason, consumers often have difficulties to assess whether some of the ingredients might be harmful for them. Consequently, patients are exposed to a risk of buying a cosmetic product that might cause a minor to severe allergic reaction. A Google *Glass*-based software solution for consumers suffering from skin allergies is presented. It enables users to check cosmetic products in a mobile context and empowers patients to make informed buying decisions. In particular, the solution could help to avoid or reduce the risk for allergic reactions.

Keywords. Patient Empowerment, Smart Devices, Google Glass, Allergies

Introduction

Nowadays, a large group of people suffers from allergies. Many substances contained in cosmetic products (e.g., shampoos, body lotions, sun blockers, etc.) can lead to allergic reactions for certain individuals. Such reactions are often associated with a decreased quality of life for those affected.

Though all ingredients are printed on the product itself, it is difficult for many consumers to identify those substances, which might trigger allergic reactions. Additionally, some ingredient names are ambiguous, i.e., the names of active agents are similar to each other. Therefore, the meaning and the consequences are difficult to assess for laymen and could lead to misinterpretation and wrong decisions.

Even if an individual had consulted a dermatologist, had himself/herself tested for allergies and knows which allergens to avoid it can be difficult to apply this knowledge in daily life. This especially applies when he/she has to make a buying decision. Consequently, consumers are exposed to a risk of buying a cosmetic product that might trigger a minor to severe allergic reaction.

In this paper we present a Google *Glass* [1] enabled software solution – termed *GlassAllergy* (GA) – that empowers consumers to make an informed buying decision based on facts that originate from an individual allergic profile. Thus, patients are supported to avoid minor to severe allergic reactions.

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Figure 1: Testing for allergies at a dermatologist. This includes an examination with a standardized set of substances found in cosmetic products.

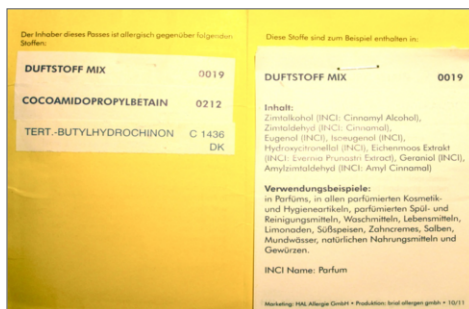


Figure 2: A typical German allergy card as issued by a dermatologist. In this particular example, its owner has been diagnosed to be allergic to (a) *Parfum*, (b) *Cocoamidopropylbeatine* and (c) *Tert.-Butylhydrochinon*.

1. Material & Methods

1.1. Allergic Reactions

According to the German Association for Allergies and Asthma² about 20% of the German population (about 16 million people) shows allergic reactions like itching, swelling or pustules if they are exposed to certain allergens. In particular, chemical agents found in cosmetics can cause minor to severe skin reactions [2]. As depicted in Figure 1, skin allergy tests can be conducted to determine which ingredients cause conflicts for an individual.

Figure 2 shows a typical German allergy card as issued by a dermatologist. It lists all names of chemical agents a patient is diagnosed to be allergic to. The allergy card also contains a short description and information on typical product groups a certain substance is contained in, as frequently found in drugstore products. As advised in the allergy card, a patient shall strictly avoid any contact with the substances listed. The names of such substances are predominantly expressed in expert language.

Yet, substance names are often too complex to memorize for laymen and the allergy card might not always be at hand when shopping for cosmetic products. In addition, ingredient names are typically printed in tiny font size. For this reason, reading the complete list of substances can consume a lot of time. Moreover, some substances have different spellings or are shortened due to limited space on the product itself.

1.2. Consumers Seeking for Advice

Finding relevant information can be a challenging task, which is especially true for health related information. People's needs to search for individual health related information is often referred to as health information seeking [3]. In particular, such activities involve "any non-routine media use or interpersonal conversation about a specific health topic and thus includes behaviors such as viewing a special program about a health-related treatment, using a search engine to find information about a

² daab – Deutscher Allergie- und Asthmabund e.V. (www.daab.de)

particular health topic on the Internet, and/or posing specific health-related questions to a friend, family member, or medical practitioner outside the normal flow of conversation” [4].

Given a mobile context, some systems focus on prevention aspects by delivering recommendations via mobile (smart-) phones. Thereby, patients suffering from chronic diseases (e.g., Diabetes mellitus) or people addicted to tobacco receive personalized advice based on their individual (daily) condition [5]. Ghorai et al. presented a case based recommender system that sends advice to smokers willing to quit [6]. Their approach computes recommendations based on a user’s behavioral data collected over time.

1.3. Wearable Devices & Google’s Glass Development Kit (GDK)

Innovative wearable devices are on the verge of entering the consumer market. A well-known example is Google’s *Glass* device. It might be the next evolutionary step in the field of mobile computing, as consumers can still use both of their hands while at the same time receiving calls, sending e-mails or taking pictures.

In addition to the regular *Android* software development kit (SDK) for smartphones, Google released the so-called *Glass* development kit³ (GDK) in late 2013. It enables developers to access the head mounted display and the built-in camera of the device. Thereby, the implementation of a barcode scanning feature is made possible. With the GDK, developers can also use speech recognition techniques provided by built-in hardware and integrated software components. Thus, voice trigger commands can be defined, which allows users to interact with a wearable device hands free.

2. Results

2.1. Concepts & Architecture

As an initial step, an individual has to create a personal profile at a service provider’s website. This profile contains all chemical substances that could cause a user (serious) harm.

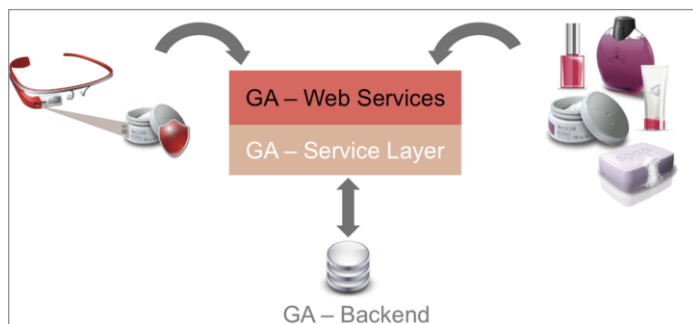


Figure 3: System Architecture of the GA project. Products of different vendors are stored in a database. It contains more than 20,000 chemical agents (i.e., European INCI terms) and about 50 typical drugstore products. Consumers access the GA web services via a secured connection in a mobile context. A Google *Glass* device in combination with a paired smart phone sends REST-based calls to the web service endpoint which computes contraindications of scanned products.

³ <https://developers.google.com/glass/develop/gdk/>

The list of agents can be entered and edited by him/herself and should be the outcome of allergy tests conducted by a dermatologist. Such a profile can be altered via a web browser or a smartphone application. As depicted in Figure 3, Google *Glass*' built-in camera is used to scan the EAN-8 or EAN-13 barcode of a product of interest. Thereby, a unique product identifier is obtained while shopping in a drugstore or a supermarket. Thus, a barcode that represents a composition for chemical substances can be used for substance checks against an individual's allergy profile. Subsequently, the identifier is sent to a web service. Such a service computes whether any of the ingredients within the scanned product might be harmful for a customer who originally made the request. As a response to the substance check, a web service implementation sends back a list of conflicting ingredients to the *Glass* device. The result of the check indicates if there are any contraindications related to the product of interest. If so, a visual warning or alert is displayed to the user within the head-mounted display.

In addition, a short explanation can be presented if the user requests detailed information. As a result, consumers are enabled to make an informed buying decision in a mobile context.

2.2. Prototype & Early Findings

As a first prototype, we implemented a *Glass*-enabled mobile application that scans barcodes of cosmetic products. As depicted in Figure 4 (a), we conducted a field test of our solution. We quickly noticed that positioning a product during a scan is essential for a quick and precise recognition of a related barcode.



Figure 4 (a): A drug store visit using a smart glass device. Note well: Only products contained in our database can be checked for.



Figure 4 (b): Different barcode sizes and product shapes can influence the product recognition process. Consumers might need some training to adjust angles and distances.

In a laboratory test setup we experienced minor difficulties with the recognition of some products. As it turned out, ambient light can have negative effects on the scan process and thus on the recognition duration. By contrast, the percentage of products identified correctly was a lot higher in the ambient light in a real-life shopping environment at local drugstores, as depicted in Figure 4 (b). Different product shapes, material and color can also influence the duration of the scan process. Yet, we found that a quick check of a product of interest is possible with our solution.

Establishing a communication channel via a smartphone can be difficult in certain situations, e.g., in buildings with thick walls or in rural areas. As mobile broadband access improves and technology evolves over time, it can be expected that communication via smartphones or wearable devices will become more robust in the next years. During our field tests we experienced no major communication interruptions. For this reason, we consider communication aspects in a mobile context as a secondary issue. In terms of usability and as voice commands can be issued, it is possible to pick up a product and initiate an allergy check in a rather short time. By contrast, a smartphone-based solution would require a consumer to first retrieve the device from a handbag or a jacket. Moreover, it would require him or her to use at least one hand to hold the smartphone.

3. Discussion

A Google *Glass*-based software solution for consumers suffering from skin allergies was presented. It enables users to check cosmetic products in a mobile context and empowers patients to make informed buying decisions. In particular, the solution can help to avoid or reduce the risk for allergic reactions.

As the proposed solution is still at a very early stage, a full evaluation remains an open task. Yet, we tested our solution in a real life scenario during a first field test in various drugstores in Germany. First experiments with colleagues revealed skepticism for being tracked or monitored. In addition, we found that users should be made familiar with the handling of a Google *Glass* like devices up front. In particular, the use of voice commands and touch-enabled templates is a new experience for most users.

As our database of cosmetic products contains only around 50 products, the test with real life products was limited in terms of product diversity. It remains an open task to (semi-)automatically fill a large amount of products into our database. Yet, we are confident to increase that number and are open to find support from the research community. Displaying consumer-friendly translations for chemical agents into the field of vision remains future work. Hence, a huge resource of synonyms, laymen terms and other helpful information could be made available.

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