Virtual reality as a technological solution for gastronomic tourism

A realidade virtual como uma solução tecnológica para o turismo gastronómico

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Márcio Fontana Catapan
PhD in Mechanical Engineering from the Universidade Federal do Paraná (UFPR)
Institution: Universidade Federal do Paraná (UFPR)
Address: Av. Cel. Francisco H. dos Santos, 100, Jardim das Américas, Curitiba – PR
CEP: 81530-000
E-mail: marciocatapan@ufpr.br

Fuad Antonio Pumarejo Mercado
PhD student in Design at the Universidade Federal do Paraná (UFPR)
Institution: Universidade Federal do Paraná (UFPR)
Address: Av. Cel. Francisco H. dos Santos, 100, Jardim das Américas, Curitiba - PR
E-mail: fuadpumarejo@ufpr.br

Lucas Gregory Gomes de Almeida
PhD student in Design at the Universidade Federal do Paraná (UFPR)
Institution: Universidade Federal do Paraná (UFPR)
Address: Av. Cel. Francisco H. dos Santos, 100, Jardim das Américas, Curitiba - PR
E-mail: lucas.gregory@ufpr.br

ABSTRACT
During the Covid-19 pandemic were people could not leave their homes, it was difficult to do gastronomic tourism. This generated a great negative impact on mental health in people, in the same way it had a great reduction in the knowledge of the world gastronomic cultural heritage. The objective of this work was to measure the impact of a virtual environment for gastronomic tourism. Was made an exploratory study with part of the population to experience the coffee growing environment using virtual reality devices at home. As a solution to alleviate claustrophobia caused by isolation and as a tool to promote or enhance the gastronomic cultural heritage.

Keywords: virtual reality, gastronomic tourism, gastronomy, COVID-19, coffee.

RESUMO
Durante a pandemia de Covid-19 em que as pessoas não podiam abandonar as suas casas, era difícil fazer turismo gastronómico. Isto gerou um grande impacto negativo na saúde mental das pessoas, do mesmo modo que teve uma grande redução no conhecimento do...
patrimônio cultural gastronómico mundial. O objectivo deste trabalho era medir o impacto de um ambiente virtual para o turismo gastronómico. Foi feito um estudo exploratório com parte da população para experimentar o ambiente de cultivo do café utilizando dispositivos de realidade virtual em casa. Como solução para aliviar a claustrofobia causada pelo isolamento e como ferramenta para promover ou valorizar o patrimônio cultural gastronómico.

**Palavras-chave:** realidade virtual, turismo gastronómico, gastronomia, COVID-19, café.

1 INTRODUCTION

Due to the current Covid 19 pandemic, isolation was established as the main preventive measure. This generated cultural consequence in the gastronomic tourism sector, which are manifested in the decrease in cultural knowledge and an increase in mental illnesses such as depression and claustrophobia for not leaving home.

In this work, a "virtual reality gastronomic experience" is studied as a possible solution, which will be measured through an exploratory study where a virtual environment of gastronomic tourism is recreated, in which people would enter and at the same time consume typical foods of the environment recreated. Subsequently, questionnaires are carried out to verify if this experience works as a solution to increase cultural knowledge and improve the emotional state of people.

1.1 MAIN GOAL

Generate knowledge of gastronomic tourism through experiences in virtual reality.

1.2 SPECIFIC OBJECTIVES

- Identify the impact of virtual reality on gastronomic tourism.
- Describe the process of recreating a gastronomic environment in virtual reality.
- Analyze the experience obtained from gastronomic tourism in virtual reality.

1.3 JUSTIFICATION
Removing the physical barriers to experience gastronomic tourism in a virtual way, could reduce claustrophobia at home, stimulate gastronomic knowledge and real tourism. Because through the same virtual space, various virtual samples of gastronomic tourism could be experienced, which could function as an invitation to a real sample.

2 BIBLIOGRAPHIC REVIEW

To understand the current context in this section, we begin by studying the concept of gastronomy and its cultural impact that motivates tourism. Then, the consequences that Covid 19 has had on the psychology and gastronomic culture of people are studied. To later contextualize how virtual reality can provide solutions for those consequences that the pandemic has left, being a possible alternative to experience gastronomic tourism even in isolation.

2.1 GASTRONOMY

According to (BRILLAT-SAVARIN, 2004), gastronomy is not limited to the preparation of food, but also to how, who, where and when consumes it. According to (DI CLEMENTE, 2014) gastronomy is not limited to the typical dishes of a locality, it also includes traditions, processes, people and the lifestyles of its environment. According to (FORERO, 2019) many tourists travel to discover new foods, carrying out a complete cultural gastronomic search. Based on these authors, it could be interpreted that gastronomy is a multisensory experience that encompasses not only food but also the entire environment where it is consumed. That is why in this work gastronomy is defined as the multisensory experience of consuming food from each culture. Being tourism the search for the place where that experience happens. As can be seen in figure 1.
It can be seen from figure 1 that three concepts emerge from the definition of gastronomy: culture, experience and tourism. Next, the relationship of each one with gastronomy is studied in more depth.

According to (UNESCO, 2003) the intangible heritage is made up of the cultural expressions and traditions that a group of people preserves with respect to their ancestry, for their future generations. Gastronomy is part of this intangible heritage. So losing some ancestral culinary knowledge would be a great cultural loss. That is why UNESCO, with the aim of safeguarding culture, is declaring as cultural heritage of humanity many of the culinary knowledge that are transmitted from generation to generation in different populations. But in order to be selected as international heritage assets, these must previously be listed as national heritage assets, as (UNESCO, 1972) established in the convention on world cultural and natural heritage. It is mainly the responsibility of each government to safeguard its heritage.

According to (MEGALE, 2021) This has led various countries to promote cultural research within communities with autochthonous gastronomy, as the Institute of Artistic and National Historical Heritage (IPHAN, 2008) of Brazil did, which classified Canastra cheese from Minas Gerais as heritage. cultural, consequently this increased the national tourist attraction of the Sierra de Canastra where it is produced. This demonstrates the relationship that exists between gastronomic heritage and tourism.
2.2 COVID 19 PANDEMIC

According to (SCHIOPU, 2021) the main concerns about the new coronavirus come from the fact that it is more transmissible than the seasonal flu, it has an exponential growth and the entire population of the world is susceptible to getting sick due to the immunity that would take a long time to acquire.

According to (CONTI, 2017) in case of pandemics, the tools at hand to stop the transmission of the disease are isolation, quarantine, social distancing and community containment. Because of this, many countries have taken measures ranging from social distancing, isolation, quarantine, and even restrictions on international flights, generating various cultural and psychological consequences in society, as shown in figure 2.

According to (RODRÍGUEZ, 2019) in South America tourism contributes to cultural development due to its economic benefits generated by the consumption of cultural products, such as handicrafts, entertainment and gastronomy, among others. This affects the economic sustainability of formal or informal cultural producers, in such a way that the sale of cultural products becomes their source of income, which allows cultural agents to continue promoting their cultural products. For this reason, the impact that the pandemic has had at the cultural level has been drastic in South America, as can be seen.
in figure 03, where a 92% decrease in the arrival of annual tourists can be seen in 2020 compared to 2019.

Figure 03 – International tourist arrivals

This has affected the entire cultural sector in South America, since part of its sustainability lies in the economy that comes from tourism. Consequently reducing the gastronomic production of local culture, as well as the international knowledge of it. A great example of this is the carnival in Rio de Janeiro in Brazil, which according to (FGV, 2021) lost approximately one billion dollars due to its cancellation due to the pandemic, which consequently reduced tourism and this directly affected professionals in the culture that prepare all year for this event which is their main source of income.

All this context has psychologically affected many people. Therefore, many governments have had to offer tele-psychological assistance, as can be seen in figure 04. Where 70% of the countries worldwide had to adopt technological tools to provide remote psychological therapies for citizens, with the in order to deal with the emotional crises that the pandemic has generated.
2.3 VIRTUAL REALITY

Virtual reality, because it has the possibility of being a tool for therapeutic and educational use, is presented as a solution to the cultural and psychological consequences brought by the pandemic.

According to (BEIDEL, 2019) The ability to simulate different realities and experiences has promoted the use of virtual reality in psychotherapy where techniques for the treatment of phobias and anxiety disorders have been implemented.

According to (CATAPÁN et al., 2022) Virtual reality, being an active learning methodology, can generate knowledge retention of up to 90%.

According to (SMITS, 2020) VR rehabilitation as part of telemedicine solutions has several advantages compared to traditional rehabilitation. First, given the continuing need for social distancing in our society, therapy can be delivered remotely. Second, virtual reality allows therapists to treat patients simultaneously. While therapists must monitor sessions remotely in some cases, live support is generally not required, increasing
patients' autonomy and reducing therapists' workload. Other telemedicine solutions, such as video calls and video or game therapy on a flat screen, offer some similar advantages. What makes virtual reality particularly different is that it provides its users with an immersive environment in three dimensions. Immersion makes therapy more fun and reduces distraction from the external environment. Both can increase adherence and commitment to therapy. Additionally, virtual reality can serve to distract patients from the fatigue and anxiety experienced that would otherwise hinder their ability to move.

According to (MERCADO e CATAPÁN, 2022) Education through virtual reality is a model that allows distance learning and asynchronously, therefore, in the midst of the necessary isolation during the pandemic, it is an efficient model for the transmission of knowledge, since it does not require physical learning environments.

Virtual reality tourism is mainly developed with 360 degree videos which generate a great visual experience for the user. According to (WAGLER, 2018) 360 degree video tourism can be a strong analogue to a real world experience. According to (GONZÁLEZ, 2014) Illusory states can be convincing in 360 video technologies, as long as users do not try to interact with the environment. These experiences can generate realistic brain responses; for example, motor cortex activation is found even in static configurations when a virtual object attacks a static participant in virtual reality. According to (CATAPÁN et al., 2021) Virtual reality technology also has potential as a multiplayer platform, so in a virtual simulation people located in different parts of the world could meet in these environments and interact.

According to (CATAPÁN et al., 2021) 360-degree video virtual reality can have great benefits to introduce the user to a gastronomic environment. According to (GARIBALDI, 2020) Wine producers from all over the world are developing digital tours from home, creating a previous experience of a place that can be visited later. Developing 360-degree videos and reality tours inside their wine cellars and vineyards, to overcome temporary closures caused by the pandemic.

### 3 METHODOLOGICAL PROCEDURES

The scientific method to be implemented in this work will be "Design Science". According to (SANTOS, 2018) Design Science is a research method where the efficiency
and effectiveness of an artifact (product, service or system) in solving a problem category are developed and evaluated. According to (MERCADO et al., 2021) virtual reality is a technology that can present new updates and it is encouraged that with this model it is easy to continue or replicate for future studies, allowing the development and evaluation of the system proposed in this research. Through multiple iterative cycles of the Design Science method, thus leaving room for future studies that allow complementing the results found in this exploratory study.

Following this method, a system will be developed that will consist of a simulation of a gastronomic experience in virtual reality as a way of counteracting the cultural and psychological consequences generated by the Covid 19 pandemic. Subsequently, the effectiveness of this system will be evaluated as a solution to the problem with a sample of the population.

This system will be evaluated quantitatively and qualitatively. Quantitatively, it will be measured how efficient the cultural learning of gastronomic tourism is in the sample of the selected population, through a statistical analysis that will have as input data the results of a questionnaire of knowledge acquired during the simulation in virtual reality.

In this test, the names and physical characteristics of the food consumed and the gastronomic place will be asked. Qualitatively, it will be measured how efficient the psychotherapeutic stimulation is in the sample of the selected population, through a questionnaire with a Likert scale where it will be measured how much they agree or disagree with respect to the psychosensory stimulation generated during the gastronomic experience in reality virtual.

3.1 SYSTEM DEVELOPMENT

This system will be developed to work on virtual reality devices. An experience will be generated that will stimulate the five senses. With the virtual reality device, the visual and auditory senses will be stimulated through a simulation of the gastronomic tourism environment. With food, the senses of smell, taste and touch will be stimulated. This can be seen in figure 05.
From this impact on the senses, it is expected to generate an illusory psychosensory stimulus and a cultural cognitive stimulus.

According to (GONZÁLEZ, 2017) the underlying brain mechanisms that allow users to "believe" that a world generated in virtual reality is indeed real arises from ascending multisensory processing in the brain. Being an illusion that the brain takes as real, a psychosensory stimulus is generated that affects the emotional state of the person.

In this simulation, the level of emotion generated in the user by the virtual reality simulation will be analyzed. Measuring through the questionnaire (LIKERT, 1932) the results obtained in a qualitative way.

According to (BOURGEOIS, 2008) Human beings easily internalize stereotypes associated with their life experiences and what they have learned from the environment. Virtual reality, being an experience where a new environment is simulated, could stimulate cultural learning of the environment experienced by the user.
As can be seen in figure 06, the virtual reality device would seek to generate a cognitive stimulus that results in visual learning of the characteristics of the simulated environment.

Based on this, the level of learning generated in the user by the virtual reality simulation will be analyzed quantitatively. Through a knowledge questionnaire, in which the percentage of characteristics learned from the simulated environment will be evaluated.

According to (OIC, 2021) Brazil is the largest producer and exporter of coffee in the world. Being the state of Minas Gerais the region where more coffee is produced. Therefore, it is proposed as an environment to simulate one of the coffee-producing mountains of southern Minas Gerais. As objects to be evaluated, the objective characteristics of the mountains, the coffee plant and the coffee fruit will be taken into account. As subjective characteristics the emotional impact that the person receives from the experience.

3.2 POPULATION SAMPLE SELECTION

Due to the current limiting context with the Covid 19 pandemic, the population sample will be selected randomly and completely online, through virtual reality study forums, where the publication will be made for system experimentation and people will be able to enter. In such a way that this group will experience the virtual simulation at
home through a 360 degree video in virtual reality. A manual will be shared with this group with the instructions for the experimentation of the simulation. Demographic data will not be taken into account in this study. This is because in this work an initial study is carried out to understand the level of emotional and cultural impact that virtual reality can have regardless of the demographics of the person who performs it. Demographic data will be taken into account for future work.

3.3 DATA COLLECTION INSTRUMENT

As data collection instruments, a questionnaire will be carried out that will have two sections of questions. The first section will be made up of subjective questions, seeking to measure the emotions generated by the simulation through a scale (LIKERT, 1932). The second section will be made up of objective-descriptive questions about the characteristics of the gastronomic tourism environment. Figure 07 shows the type of analysis of both sections.

![Figure 07 – Measurement Questionnaire](source: Authors)

**4 APPLICATIONS AND RESULTS**

A simulation corresponding to the Serra da Mantiqueira in Minas Gerais was developed for this system. According to (MARETTO, 2016) this is one of the destinations with the highest gastronomic tourism in South America due to its large production of Arabica coffee and its beautiful landscapes.
The virtual reality system used was the 360 video with audio corresponding to the simulated environment and complemented with the stimulation of the senses of touch, taste and smell with food. Figure 08 shows the simulation in equirectangular panoramic view.

![Figure 08 – 360 Video Equirectangular Panoramic](image)

Source: Authors

After the development of the virtual reality video, the blog (RVG, 2021) was created where the link of the 360 video, the questionnaire and the manual on how to carry out the experience were linked. This blog was shared in the virtual reality study group (BRVR, 2021) openly inviting users to live the experience and then evaluate it. In total, 50 responses were collected from users who evaluated the experience.

4.1 USER APPLICATION

For the application of this experience, the development of the manual was important, since since its application will not have physical supervision, it was necessary to leave a clear orientation of how people could carry out the experience at home. Therefore, this manual indicates what is needed to live the experience, and the step by step of the procedure.

4.2 ANALYSIS OF RESULTS

For the interpretation of the results of this work, it must be taken into account that, being an exploratory study with a new technology that is still in development, the results obtained here do not fully delve into everything that encompasses cultural earning and psychosensory stimulation. This is because both topics are very broad in terms of all the
possible aspects that could be evaluated in each one and in addition to this, virtual reality still presents many technological limitations to generate a completely immersive experience. Therefore, after the result of each section of the questionnaire, its limitations are considered and what recommendations can be taken into account for future studies with this type of technology.

Figure 09 shows the results of the subjective questions of the questionnaire (questions 1 to 6). These were measured through a scale (LIKERT, 1932) with 5 evaluation points that are: Totally disagree, disagree, neutral, agree and totally agree. All this in order to qualitatively measure the level of psychotherapeutic stimulation generated in the users who live the experience.

![Figure 09 – Results subjective questions](source: Authors)
It could be interpreted that the gastronomic experience in virtual reality does have potential as a psychotherapy to improve the mood of people, because it had a positive impact of more than 80% on the responses given by the users who lived the experience. But it is important to point out that this result has limitations that could be considered for future studies, such as the fact that no control cases were carried out where variations were made in the variables. An example of this would be to analyze whether the positive impact on an emotional level would be the same without the combination of virtual reality and sensory stimulation, because there was not a group that only had the experience in the simulation, and another that only had the sensory experience of coffee. So that it can be better understood, to what extent the impact arises from the combination of these aspects or not. In addition, an open question was not posed so that the participants could include their own concepts related to their emotions.

Although culture is defined as "the set of ways of life and customs, knowledge and degree of artistic, scientific, industrial development, in a time, social group, etc." (RAE, 2021). Which reflects its multidimensional breadth, in this work only the physical characteristics of the arabica coffee plant that were simulated in the experience were taken as the cultural area of measurement in order to generate visual learning from it.

Based on the results obtained, it could be interpreted that the gastronomic experience in virtual reality does have the potential as a model to stimulate people's cultural learning in gastronomic tourism, because more than 80% of the users who participated in the experience answered correctly, which were the physical characteristics that corresponded to the arabica coffee plant. But it is important to note that this test and its results are limited in terms of what fully encompasses cultural learning, because the content that was given relevance and evaluated corresponded to the physical characteristics of the arabica coffee plant. Because recreating the multiple dimensions that cultural learning implies in virtual reality simulation entails a more in-depth study, such as conducting field studies with natives of the region to simulate which are not considered in this work but can be considered for future studies, to achieve a better development of the variables of the recreated environment. An example of this would be to add to the simulation a virtual character of a native of the region with whom you can start a conversation while enjoying the food and that he serves as an educator of the
culture of his region, thus generating an experience more interactive and multidimensional learning.

5 CONCLUSIONS AND RECOMMENDATIONS

The exploratory study carried out in this paper has limitations in terms of the multidimensional breadth that encompasses culture, psychotherapy and the way in which the system was evaluated. But with the basic data obtained, virtual reality as a gastronomic experience showed potential to increase cultural knowledge and improve people's emotional state. Virtual reality can be considered as a possible model to generate psychotherapies or stimulate cultural learning of gastronomic tourism during times of Covid 19. This experience also proved to be an excellent strategy to encourage real tourism, since more than 80% of users Those who participated in the simulation fully agreed that the virtual reality experience generated greater interest in visiting the real place.

Due to the Covid 19 pandemic, the most favorable virtual reality system for users in this work was 360-degree video, being the one that can be implemented with the greatest variety of virtual reality devices. Since its form of shipment and evaluation can be easily done online through the web. Therefore, it would be recommended for future work when the Covid 19 pandemic has been overcome, to carry out a more immersive experience that is fully interactive, allowing the user to interact with other objects within the simulation. This could be done in a virtual reality laboratory with motion sensors and with supervision throughout the simulation process.

Virtual reality is a technology that is still in the process of consolidation in its use. An important part of this is developing new applications, such as the simulation developed in this work. In such a way that it becomes more attractive to the global public. Many years ago it would have seemed impossible to enjoy a coffee in the mountains where it is grown while at the same time staying at home. But with this experience it was shown that this can already be possible through virtual reality. Therefore, the most important recommendation reached with this work is to invite designers to dream, because as technology advances, what may seem impossible is becoming more
accessible. And scientific research is the foundation that allows us to give greater scope to that development.
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