Artwork

# The Rhythm of Consumption

Catarina Maçãs<sup>1†</sup> Penousal Machado<sup>1‡</sup>

<sup>1</sup>CISUC, University of Coimbra, Portugal

### Abstract

In this project, we create a set of visualizations that represent the variation of consumption in different departments of the SONAE's hypermarket chain, the biggest hypermarket's chain in Portugal. With this project, we aim to visualise the shopping preferences, and represent how the costumers change their shopping lists over time. We focus on highlighting the rhythm/pulse of consumptions and times of the year that disrupt the normal consumption patterns.

Categories and Subject Descriptors (according to ACM CCS): Visualization [Human-centered computing]: Visualization application domains—Information Visualization

# 1. Data

The data consists of the consumptions in 729 Portuguese supermarkets and hypermarkets of the SONAE's chains, which cover the entire country. When shopping in these chains, the costumers tend to use their client cards to accumulate discounts and other benefits. Currently, the number of active cards is above 6 million, which can be considered as an impressive number, specially if we take into consideration that the Portuguese population is below 11 million, and that the cards are issued by "household", and shared by the entire family. We choose this data set due to its richness, size, quality and nature. We believe that the data set is a valuable asset of the work, offering us the opportunity to transform the Portuguese consumption patterns into aesthetic artifacts, while exploring, highlighting and visualizing their periodic nature.

We analyse all the transactions made on these supermarkets and hypermarkets from May 2012 to April 2014. Each transaction corresponds to one product bought and it has properties such as price, date, and time of its purchase. Each product is placed in the product hierarchy of the company, which has 6 levels. For this work, we aggregate all the purchases in 9 distinct categories: Grocery; Alcohol & Sweets; Health care; Beauty; Clothes; Furniture; House Care; Culture & leisure; Pets & Nature Care.

## 2. Representation and Implementation

The products of SONAE's hierarchy are characterised in three types of consumption: essential; non-essential; and unknown. With this characterisation we intend to overview the consumption behaviour



**Figure 1:** Representation of each category (shape) and their types (colour): (a) Clothes, essential; (b) Health Care, essential; (c) Grocery, essential; (d) Culture & Leisure, non-essential; (e) Beauty, non-essential; (f) Alcohol & Sweets, non-essential; (g) Pets & Nature Care, unknown; (h) House Care, unknown; (i) Furniture, unknown.

of the SONAE costumers, what type of shopping they tend to do, and if their priorities change over time.

We represent the type of consumption through colour, using red, green and grey for the non-essential, essential and unknown products, respectively. Then, to differentiate all the categories, and since this representation should have less emphasis on the visualization, but at the same time, be distinguishable, we defined 9 different shapes for each category as depicted in Figure 1.

Each transaction of our data set has a defined time and date, but for this approach, we aggregate the data by day, so we can see the variation between the different days. To represent all these days, we use a grid where each row represents one month, and each cell of that row represents a day of that month. The days can also be aligned vertically in two different ways. In the first, all months start in the leftmost column, enabling the comparison of the consump-

<sup>&</sup>lt;sup>†</sup> cmacas@dei.uc.pt

<sup>&</sup>lt;sup>‡</sup> machado@dei.uc.pt

<sup>© 2016</sup> The Author(s) Expressive Proceedings © 2016 The Eurographics Association.

## Catarina Maçãs & Penousal Machado / The Rhythm of Consumption

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun
April				•		•	1	2	3	4	5	6	7	8
Мау	•	1	2	3	4	5	6	7	8	9	10	11	12	13
June		·		•	1	2	3	4	5	6	7	8	9	10
July						•	1	2	3	4	5	6	7	8

**Figure 2:** Alignment of every day in each month by the week day. Example with the first two weeks of the month April, May, June and July of 2012.

tions by quarters of the month, meaning we can compare whether in different months, the costumers behaviour is similar, or not, in the different quarters of the month. In the second, the days of the month are aligned by the day of the week, where every Monday of each week is aligned as we can see in Figure 2. This enables the comparison of the different week days and perceive the impact of the weekend on the costumers behaviours.

For the representation of the data set, we have decided to create two different outputs: a classical small multiples representation; and its representation through a video (http://cdv.dei.uc. pt/the-rythm-of-consumption/). The two representations have two different objectives. The first aims for a more analytical representation. The video aims for a more visual and entertaining representation. In the static representation, we can see how the consumptions are affected by the special events and vacations, and easily compare different days that are distant from each other. In the video visualization, we can see the difference between the days which are close to each other.

We explore two different normalisations: one global, where all the values are mapped between zero and the maximum value of all categories; and one local, where each category is mapped between zero and its maximum value. In the global normalisation, we are able to compare the consumptions values of all categories. In the local normalisation, we are able to compare the evolution of consumptions, whether they tend to grow or decline through time.

## 2.1. Results

In Figure 3, we can perceive the differences between the two normalisations. In the top image, we apply the local normalisation and we can perceive more differences in more categories than in the bottom image, where we apply the global normalisation. These two normalisations imply two different readings. In the first, we are not able to compare if one value of a certain category is higher than another from other category, but can compare how they evolve over time and in which day a certain category has its highest value. In the second image, we can compare the values of every category, as they are mapped in the same scale. However, there are big differences in the values between categories, and the only values that are more perceivable are the ones from Grocery and the Alcohol & Sweets.

In Figure 4, we can see the representation of the 24 months of our data set. In this visualisation, we align all days of every month



**Figure 3:** *Comparison between the two normalisations: local normalisation (top) and global normalisation (bottom).* 



**Figure 4:** Representations of the 24 months, from April 2012 (top row) to May 2014 (bottom row). All days are aligned by the week day and the values are normalised by the maximum value of the corresponding category.

by week day. We can perceive that the type of consumption that has the highest consumptions is the non-essential, specially in the month of December of 2012 and 2013 (8<sup>th</sup> and 20<sup>th</sup> lines). We also can see that the highest consumption in the Grocery category occurs in June 2013 (14<sup>th</sup> line).

# 3. Conclusion

With this project we intend to represent how the costumers of SONAE tend to buy. We wanted to represent the changes in the behaviour and analyse types of products that have been bought. With the video of the visualization our aim is to make the user feel engaged with the data so he/she gain interest to see the data in more detail with the classic representation of the small multiples.