# Stage Chroma thoughts

## On the internship's title

"Solving spatial conflicts" involves:

- First, *conflicts*: in the consideration of conflicts we must before what they are how do they come. They come by human's nature in motion, implied by the space their body occupies, their motion and last but not least the choices the humans make translated into actions. However, in order to have a relevant study of such conflicts it must be emphasised that they happen *because* of human's nature. Conflicts can be considered in the human's mind itself, how the decision-making process happens internally, how it happens *implicitly most of the time* with other agents (humans, robots, obstacles...)
- Second, *spatial*: the considered conflicts are *spatial conflicts*, i.e., the physical aspect of humans. Naturally, when crossing roads, for average-looking humans one could disregard minor differences and still cross the road peacefully. Relevancy is present once potential *danger* factors are to be considered for one: children, disabled, tall or slow people, etc. There lie *spatial conflicts*, as such differences may make one's reconsider his choices (as reflexes, pattern recognitions change, explicit thinking) in an appropriate motion. For more complex situations, a decisive (explicit) thinking and choice must be made. Social choice theory may then be implied internally, or with others if there is sufficient interaction (sights, motions) in order to deal with a shared problem.
- Third and last, *solving*: if we focus on *solving spatial conflicts* we can have different viewpoints.
    - Do we focus on public policies on a macroscopic level? This can involve urban organisation (crosswalks, lights, policies on how to cross, ...). There we may have an interest in mean-field game theories or global crowds study (article 2).
    - Do we focus on the user perspective? Studying the user's viewpoint is more delicate, simulation with agent-based modelling approaches *mainly* focus on understanding the human's mind to provide better insights of real-life cases, optimise actions, and so on. As such, it is more delicate to talk about *solving* directly, as we can't dictate human behaviours or force them into schemes of thinking. However, it may indirectly help into the design of other things (urban-related or ...) into tricking the human's mind to perform certain actions. Since it remains an open research axis, an easier perspective of application comes in robots (or robots in motion with humans at most): we can directly implement a motion planner in such agents making them moving with *resolved spatial conflicts*.

## On social-choice implementation

It has been discussed rapidly above, social-choice implementation may happen internally or externally in some cases. Social choice theory involves votes and strategies directly related to decision-making. The latter focuses on long-term benefits which can happen at most a few times (if not only one) considering cross-walking, as such situations are fast-paced and dynamic. Votes also are mostly considered when having all cognitive capabilities "ready" or when the time is given, dynamic situations such as cross-walking are of a different kind. Most humans walk with pattern recognitions in mind, equipped with reflexes and/or a follower mindset, rather than thinking thoroughly on how to traverse.
Social-choice theory, first-thoughts given, seems mostly relevant when changing viewpoints:

- implementing decision-making processes into non-human agents as they are programmable. Drones for example may cooperate into forming swarms or agreeing together to make a choice, such controllable factors are the most relevant for this application.
- as explicit talking interactions (considered to be clear enough for one to proceed and understand information to act upon) are rarer in cross-walking cases, we may also wonder about other types of interaction in such cases that would allow at least a quick vote where social-choice theory could be applied. For example, before crossing, if a pedestrian is given some time then he quickly checks both directions for any upcoming obstacles (this can also happen if the streets are complex and present possible obstacles from many directions). There also is an internal decision when placing himself in a certain zone before crossing, in order to have some room to reach his goal or to avoid potential trouble (too much people in another zone).
- in trying to predict a human's decision process given certain elements when he's dealing with a robot (in motion with humans for example), microscopic study then could become relevant.