

Definition of the Design Space

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1 Introduction

The Design space represents an approach to synchronize technical and legal developments. In the context of the desired legalization of autonomous driving systems there are three main agents involved:

1. **Society**, whose needs for technical innovation trigger
2. **(economic) technical developers**, whose products have to meet the requirements of
3. the **legislation** as one of the three branches of constituted society.

The aim of the design space, abstracted from the current project '**Autonomous Mobility Systems in Technology, Legislation and Society**' is to form a shared interdisciplinary platform which aims at a synchronization of the involved sciences on two levels: Communication and temporal dynamics. Therefore, the present project can also be seen as a pilot project for the interdisciplinary co-operation of orthogonal sciences.

In the following, an abstract definition of the design space with regard to the above mentioned aspects will be presented. Subsequently, the expected significance of the design space for the involved agents with regard to the present project is explained. To crystallize these and to make them tangible in their details is also the goal and task of the present research.

2 Basics

Definition 2.1 (Design Space as a Communicative Model). *The **Design Space** is an obligatory discourse between certain representatives of the constituted society and third parties representing individual interests (self-interested actors) about a subject with the aim to obtain a Nash Equilibrium between individual liberty and social boundary conditions.*

With regard to the above-mentioned social boundary conditions, it must be noted that these are not statically predetermined, but also develop dynamically with economic and social needs. Therefore, we do not consider the problem as a

dynamic evolution of a single player, bounded by social boundary conditions, but as a non-cooperative multi-agent game in the sense of game theory. The problem is non-cooperative because, although broad aspects of (technical) development and social interests coincide, the social interpretation of constitutional norms is guided by moral principles, which, according to their basic concept, must not be determined solely by economic utilitarianism. Therefore, the representatives of the constituted society and the advocates of individual interests also confront each other as opponents (constrained maximizers according to David Gauthier) who try to negotiate a maximum for all within a temporally dynamic framework that is open to social discourse.

Lemma 2.2 (Temporal Dynamics of the Design Space). *The rules of the Design Space are such that the temporal dynamics of the decisions of the constituted society and the development cycles are synchronized in a way that the first are minimized to a simple multiple of the representative cycles of the latter.*

Corollary 2.3. *The setting of this multiplicative factor for synchronization is a social decision, which must be made by the representatives of the constituted society under democratic-social pressure.*

3 The given SFB Project as a Use Case of the Design Space Concept

The present SFB project 'Autonomous Mobility Systems in Technology, Legislation and Society' is prospectively designed to develop the legal basis and feasible boundary conditions for the technical development of level 5 autonomous driving in interdisciplinary collaboration.

For this purpose, scientific contributions from the technical sciences and legal sciences will be made, taking into account ethical and sociological aspects. With respect to the above definition and corollary, the relevant time scales at stake are those of technical development and legislature. The former can cover a few hours, the latter several legislative periods. This discrepancy is to be closed with the help of the design space.

With regard to the communication specified by the design space - applied to the specific case between the legislature and technical developers - deficiencies in the technical modalities also become apparent, which still make the desired communication flow impossible in the status quo. The impossibility of technical development - especially with regard to the involved training of neuronal networks - to meet experimentally tight legal requirements for validation before a possible legislation of the development clearly shows here that simulation and forecasting must also be brought into the courtroom and the parliament. The obligatory nature of the design space is intended to force technical development, on the one hand, to show its needs in concrete terms and, on the other hand, to force the legislator and the judges to deal with technical indispensabilities. This is precisely to illustrate the benefit of the design space: Differences between

the disciplines involved should not lead to a rupture, but rather the strengths of the disciplines should be united in order to work together and synchronously on a problem, so that the social benefit is maximized and the individual actors are satisfied in a (Nash) equilibrated way. With regard to the given problem, this means that the socially desirable development of level 5 autonomous driving is neither driven by economic greed for profit nor nipped in the bud by social overcaution. The interaction of the mentioned disciplines shall elaborate a model within which this goal can soon be achieved - also on a European and international level.