On the Representation of Deadlines in a Rental Agreement

Guido Governatori [a] and Joris Hulstijn [b,1] and Régis Riveret [c] and Antonino Rotolo [c]

[a] *School of ITEE, The University of Queensland, Australia*
[b] *Vrije Universiteit, Amsterdam, The Netherlands*
[c] *CIRSFID, University of Bologna, Italy*

Many agreements and contracts contain deadlines. Because deadlines combine time and obligations, they are naturally studied by a combination of temporal logic with deontic logic [2]. A deadline, that ϕ should occur before δ, can be expressed as a formula which involves the 'until'-operator: $\text{OBL}(\phi U \delta)$. However, such a characterisation does not indicate what will happen *after* the deadline. Since deadlines can have different functions, it is likely that several notions of deadlines can be distinguished. Recently, we have presented a conceptual analysis of deadlines, based on the following parameters: whether we are dealing with an achievement or maintenance obligation. persistence of the obligation after the deadline, the choice of modal operators (permission or obligation) and the presence of an explicit or implicit sanction [3].

Temporal Modal Defeasible Logic   For each of these parameters template formulas are provided, in a logic called Temporal Modal Defeasible Logic (TMDL). TMDL is an extension of Defeasible Logic [1] to capture deontic modalities (OBL, PERM) and aspects of time, in particular intervals. For example, $\text{OBL}\,pay; [t, max]$ expresses that there is an obligation to pay from t until indefinitely. Crucial is the distinction between strict rules ($\rightarrow$), defeasible ruls ($\Rightarrow$), which allow for exceptions, and defeater rules ($\rightsquigarrow$), which define such possible exceptions. A superiority relation $\prec$ specifies which rules may overrule others, in case of conflicts. Without defeasibility it would be impossible to distinguish exceptions from violations. Clauses may be added later, overruling previous clauses. The superiority relation can handle conflicts between clauses from different authorities.

Analysing Deadlines   The analysis is based on the following parameters: *deontic operators* (OBLor PERM), whether we are dealing with an *achievement obligation* (pay defore 1st of April), or a *maintenance obligation* (refrain from noisy activities between 7p.m. and 8p.m.), whether there are *explicit sanctions*, such as a fine, and whether the obligation persists after the deadline. For example, the obligation to deliver a wedding cake would not persist after the wedding.

Case Study: Rental Agreement   The case study deals with temporal regulations from a berth in a marina. We study clauses about the right and duties of yacht owners and about payment and renewal. The contract relies on general terms and conditions from the National Water Sports Association. Here we present an excerpt.

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[1]Corresponding Author: dr J. Hulstijn, Faculty of Economics and Business Administration, Vrije Universiteit, De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands; E-mail: jhulstijn@feweb.vu.nl

Article 1: Letter, Marina Hemmeland, and renter, Hulstijn, agree to the letting, respectively rental, of berth number W156 for the summer season, which runs from the 1st of April till the 1st of November, starting from 01/02/2007.

First, we analyse a 'berth' as the exclusive *obligational right* to have one's yacht occupy a certain location, indicated by number W1056. This generates an obligation for the marina to make sure that no other yachts use the berth during the season. If not this counts as a violation. Remember the agreement starts from the 1st of February.

$$agree^{renter}_{marina}(W156):01Feb \Rightarrow \text{OBL}^{marina}_{renter}can\_use(renter,W156):[01Apr,01Nov] \quad (1)$$
$$\text{OBL}^{marina}_{renter}can\_use(renter,W156):t,\neg can\_use(renter,W156):t \Rightarrow \text{viol}(use):t$$

Article 4: Payment of the rental fee must take place within 10 weekdays from receipt of invoice, in cash at the office or by transfer to a bank account designated by letter.

Second, we analyse a 'rental fee' as the obligation to pay an amount of money in order to obtain the rights mentioned above. Thus, the right to a berth is conditional on payment. This is a standard achievement deadline formula, using a relative reference time.

$$agree^{renter}_{marina}(W156):01Feb,invoice:t \Rightarrow \text{OBL}^{renter}_{marina}pay\_renter:[x,max] \quad (2)$$
$$\text{OBL}^{renter}_{marina}pay:t,pay:t \rightsquigarrow \neg\text{OBL}^{renter}_{marina}pay:[t+1,max]$$
$$invoice:t,\text{OBL}^{renter}_{marina}pay:t+11,\Rightarrow \text{viol}(pay):t+11$$

Lessons Learned　Regarding coverage, we find both achievement obligations, like the renter's obligation to pay (2), and maintenance obligations, like (1). Most obligations have explicit sanctions, except for harbour rules regarding noise, waste and safety. Here, the implicit sanction is removal from the marina. There are no non-persistent achievement obligations, nor do we find positive permissions, but we do find prohibitions. Regarding the conceptual representation, we found that clauses may have several possible representations, with a different legal meaning. For instance, there are various ways of interpreting the silent renewal rule, that the contract is prolonged, unless one of the parties has explicitly withdrawn from it. Regarding the logic, we found that strict rules ($\rightarrow$), defeasible rules ($\Rightarrow$) and defeaters ($\rightsquigarrow$), proved extremely useful in modelling exceptions. Intervals are crucial for expressing maintenance obligations.

In general, such a logic can be used to specify software, which can (i) generate all possible 'legal' scenario's compatible with the temporal norms, (ii) check if a specific scenario or path conforms to the temporal norms, or (iii) alert users that a deadline has been passed or is about to be passed. In our case, for example, the marina needs software to generate reminders for customers who have not paid in time.

References

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