

**Abstract.** This paper proposes a framework for formalising intuitions about the behaviour of imperative commands. It seeks to capture notions of satisfaction and coherence. Rules are proposed to express key aspects of the general logical behaviour of imperative constructions. A key objective is for the framework to allow patterns of behaviour to be described while avoiding making any commitments about how commands, and their satisfaction criteria, are to be interpreted. We consider the status of some conundrums of imperative logic in the context of this proposal.

*Keywords:* imperatives, satisfaction, consistency, coherence, paradoxes

## Introduction and overview

The objective of this paper is to propose a framework for formalising intuitions about the behaviour of imperatives. We take imperatives to be commands that require some action, activity or state of affairs to be brought about, or avoided, for them to be deemed *satisfied*. A typical example is

(1) “Close the door!”

Such an imperative may be judged to be satisfied if the door is closed by the intended recipient of the imperative.

For the purposes of this paper, it is not necessary to know exactly which linguistic forms and interpretations are appropriately characterised as “imperatives”, nor exactly what constitutes “satisfaction” of a given imperative. All that we assume is that imperatives exist, that they have satisfaction criteria, and that, furthermore, some imperatives (or their satisfaction criteria) may be judged to be inconsistent with each other.

We will take *satisfaction* to play a role somewhat akin to that of *truth* in accounts of indicative assertions. We will use a notion of *consistency* of imperatives, or their satisfaction criteria, to determine whether a ‘commanding authority’ is *incoherent*. These notions of consistency and coherence can be seen to impose constraints on what it is to be a *rational* authority.

A key objective is to allow intuitions about imperatives to be formulated and expressed as directly as possible, without assuming any particular

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Under review. *Not for circulation.*

32 interpretation, such as possible worlds, actions, or non-classical notions of  
 33 entailment. The aim is for us to be able to consider imperatives in isolation,  
 34 without being confounded and distracted by other, independent, foundational  
 35 issues.

## 36 1. Imperatives in Natural Language

37 Imperatives can be combined with each other and with indicatives. Here we  
 38 provide some examples. These examples are not intended to be exhaustive.  
 39 They merely highlight some key aspects of the behaviour of imperatives that  
 40 we seek to capture (§2). Some of these linguistic constructions will also feature  
 41 in the discussion of various conundrums and paradoxes (§3).

### 42 1.1. Conjunction

43 Imperatives can be conjoined with each other.

44 (2) *“Jump out of the window, and land on the pile of mattresses!”*

45 In general, we should avoid assuming this is equivalent to commanding the  
 46 individual conjuncts separately. For example, we should not assume that  
 47 (2) entails the command *“Jump out of the window!”*. This can be seen  
 48 by considering the case where partial satisfaction is explicitly stated to be  
 49 undesirable, as in *“... But don’t just jump out of the window, ...!”* [19].

50 Of course, it would be incoherent to command (2) while also commanding  
 51 (3).

52 (3) *“Don’t jump out of the window!”*

53 The case made here is that such a notion of *(in)coherence* can stand as a  
 54 weak proxy for *validity*. Instead of saying that there is a valid entailment  
 55 from command  $a \wedge b$  to command  $b$ , for example, we can argue that it is  
 56 *incoherent* for an authority to command both  $a \wedge b$  and  $\neg b$  at the same time,  
 57 as their satisfaction criteria are inconsistent with each other (§2.2.3).

### 58 1.2. Free-Choice Disjunction

59 Disjunctive imperatives (4) often give rise to a free choice as to how they are  
 60 to be satisfied [21].

61 (4) *“Go to the beach or play in the park!”*

62 With free-choice disjunction there is a sense in which “permission” is granted  
 63 to do either, by indicating a space of legitimate possibilities [8]. In this regard  
 64 it appears incoherent to combine the command (4) with (5), unless the latter  
 65 is taken to be a correction, or implicit refinement.

66 (5) “*Don’t go to the park!*”

67 Given this permissive, free-choice interpretation of disjunction, it seems  
 68 we should not be able to “introduce” a disjunctive command (cf. §3.1). That  
 69 is (4) should not follow from the command (6), even though the satisfaction  
 70 conditions of the latter should also satisfy the former.

71 (6) “*Play in the park!*”

72 There is a question as to whether free-choice disjunction supports an  
 73 *exclusive* or *inclusive* interpretation. Under an exclusive interpretation of (4),  
 74 going to the beach *and* playing in the park is not permissible and would fail  
 75 to satisfy the command. We will formulate both weak (inclusive) and strong  
 76 (exclusive) interpretations (§2.2.1).

### 77 1.3. Weak Disjunction

78 An alternative interpretation of disjunctive examples such as (4) is where  
 79 the subject has been commanded to go to the beach or to play in the park,  
 80 but it is underspecified as to which is the case. This is sometimes referred  
 81 to as *weak disjunction*. It might be analysed by some form of meta-level  
 82 disjunction. This paper focuses on the free-choice interpretation.

### 83 1.4. Negation

84 Commands can contain negation, as in (7).

85 (7) “*Don’t go to the beach!*”

86 It is incoherent to command something and its negation. Indeed it is incoher-  
 87 ent to endorse any commands with satisfaction criteria that are inconsistent  
 88 (§2.2.3).

89 These cases are to be distinguished from the ‘meta-level’ negation of (8),  
 90 where the existence of a command is being denied.

91 (8) (a) “*It is not the case that you are commanded to go to the beach!*”

92 (b) ‘There is no command of the form “*Go to the beach!*”’

93 This paper focuses on object-level negation.

94 **1.5. Conditionals**

95 Conditionals may be formed where the antecedent is a proposition, and the  
96 consequent is an imperative (9).

97 (9) *“If you see John, say hello!”*

98 If the antecedent is true, then the satisfaction conditions of the consequent  
99 become salient.

100 We may wonder whether we can infer that *“say hello!”* has actually been  
101 commanded *as such* in the event that John is seen<sup>1</sup> or whether the conditional  
102 command is effectively irreducible (cf. §2.2.1).

103 It is conceivable that *avoiding John* counts as satisfaction of (9). This  
104 interpretation is perhaps more salient in cases where the antecedent is morally  
105 questionable, as with (10).<sup>2</sup>

106 (10) *“If you hit John, then apologise!”*

107 **1.6. Pseudo Imperatives**

108 Pseudo-imperatives are another form of expression in which imperatives are  
109 combined with propositions [7, 11, 10, 23, 33]. Syntactically we can consider  
110 two variants, one involving disjunction, the other conjunction.

111 **1.6.1. Pseudo-Or**

112 Disjunctive pseudo-imperatives are expressions such as (11).

113 (11) *“Take another drink, or you will be thirsty!”*

114 This appears to have imperative force—namely *“Take another drink!”*—  
115 combined with propositional information—*“If you fail to take another drink,  
116 you will be thirsty”* (cf. [11]). This might be considered a variant of free-choice  
117 disjunction, where the second disjunct will come about “by default” if the  
118 first disjunct is not satisfied. We may question whether the propositional  
119 interpretation is effectively offering any kind of *guarantee* that the proposi-  
120 tional component will be false if the imperative component is satisfied. It  
121 would appear somewhat incoherent to say (11) together with (12) (§2.2.3).

122 (12) *“Don’t take another drink!”*

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<sup>1</sup>This is known as “propositional detachment”.

<sup>2</sup>Such cases might be expressed more naturally as in *“If you hit John, then you must apologise!”*, using modal propositions.

### 1.6.2. Pseudo-And

Conjunctive pseudo-imperatives appear to come in two flavours, exemplified by (13a) and (13b).

(13) (a) *“Take another step and you will die!”*

(b) *“Take another step and you will see the treasure!”*

These can be taken to correspond to a threat, or a promise, respectively [22]. Arguments have been made that conjunctive pseudo-imperatives are essentially propositional in nature, and are not imperatives as such. They are judged to be true propositions if the propositional conjunct is true when the “imperative” conjunct is satisfied [11]. Determining what counts as a promise or a threat requires a value judgement, either of the outcome itself, or some evaluation of the outcome weighed against the cost of satisfying the imperative clause. We will not consider such pragmatic issues here.

As with the disjunctive case, we may question other aspects of the logical behaviour of such expressions, in this case whether it behaves like material implication, or whether it is better characterised in some other way—as a “causative” or “hypothetical” conditional, for example.

The fact that conjunctive pseudo-imperatives appear to be embeddable within other propositional contexts offers some confirmation that they are essentially propositional in nature.

## 2. Formalisation

The formalisation that follows is intended to be used as a framework for expressing theories about the semantics of imperatives. Where possible, only minimal ontological commitments are made. For example, imperatives will not be required to have, or be related to, overtly propositional content, and their satisfaction criteria will not be tied to any particular notion, such as the post-conditions of actions. That is not to say that the content of an imperative cannot be characterised as relating to some agentive sentence [6], or that their satisfaction cannot be expressed in terms of actions, merely that no such commitment is made here.

First we give the syntax and notation, and then rules for the judgements of inconsistency, incoherence, satisfaction, and truth.<sup>3</sup> An abbreviated no-

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<sup>3</sup>For compactness, the syntax is given in BNF notation. An alternative would be to present the entire theory, including the syntax, in terms of judgements, as with Typed Predicate Logic [36].

155 tation for systems-of-commands is used in the analysis of inconsistency and  
 156 incoherence. A notion of an “obedient subject” is also discussed.

## 157 2.1. Syntax

158 To formalise the interpretation of imperatives and propositions, and express  
 159 judgements about them, we must have a syntax for their representation.  
 160 Given that imperatives may be combined with propositions, there is some  
 161 interplay between these two categories.

162 After the object level syntax has been presented, the notation for ex-  
 163 pressing judgements about members of the categories of imperatives and  
 164 propositions can be given. This language of judgements is used to express  
 165 rules governing the behaviour of imperatives and propositions (§2.2). To  
 166 improve the readability of some of these rules, abbreviations for systems of  
 167 commands are introduced.

### 168 2.1.1. Imperatives

169 We assume there is a category of expressions  $i$  that represents the substantive  
 170 content of atomic commands, sometimes known as *practives*. More complex  
 171 imperatives can then be formed from these atomic commands.

172 (14) *Basic imperatives*

$$173 I_b ::= i \mid \neg I_b \mid I_b \wedge I_b \mid I_b \vee_{FC} I_b$$

174 Such practives may be distinct from propositions [6]. Where possible, the  
 175 formalisation will remain neutral on such ontological issues.

176 The operators  $\vee_{FC}$  is used to highlight the intended free-choice interpre-  
 177 tation, although it may be appropriate just to use  $\vee$  (especially if we take the  
 178 view that weak disjunctive commands are not to be expressed with a narrow  
 179 scope disjunction).

180 The category of conditional imperatives can be given as in (15).

181 (15) *Conditionals*

$$182 I_c ::= P \rightarrow I_b \mid P \rightarrow I_c$$

183 where  $P$  is a proposition.

184 This syntax assumes that the conditional structure can nest, provided only  
 185 the right-most, final consequent is a basic imperative.

186 The category that represents the content of all imperatives, including  
 187 basic, conditional, and disjunctive pseudo-imperatives is given by (16).

188 (16) *Imperatives*

189  $I ::= I_b \mid I_c \mid I_b \vee P_c$

190 where  $P_c$  is a classical proposition.

191 We will typically use “ $a$ ” to denote an individual imperative when dis-  
192 cussing judgements about imperatives or imperative constituents.

### 193 2.1.2. Propositions

194 Classical propositions can have their usual representation.

195 (17) *Classical Propositions*

196  $P_c ::= p_c \mid \neg P_c \mid P_c \wedge P_c \mid P_c \vee P_c \mid P_c \rightarrow P_c$

197 where  $p_c$  represents atomic classical propositions.

198 The category of classical propositions can be extended to a more general  
199 category that includes the propositional characterisation of pseudo-imperative  
200 expressions.

201 (18) *Propositions*

202  $P ::= P_c \mid I_b \wedge P \mid I_b \vee P_c$

203 Typically, we will use “ $p$ ” to denote an individual proposition when  
204 discussing judgements involving propositions, or propositional constituents.

### 205 2.1.3. Judgements

206 A critical part of the proposed framework is a collection of *judgements* that  
207 can be made about imperatives, and propositions. Patterns of entailment  
208 can be formulated using these judgements. In the case of propositions ( $P$ ),  
209 we have judgements corresponding to whether they are true or false. In  
210 the case of individual imperatives ( $I$ ), there are judgements as to whether  
211 they have been commanded, satisfied, or not satisfied. Given a collection  
212 of imperatives ( $I, \dots, I$ ), there are judgements as to whether they, or their  
213 satisfaction criteria, are inconsistent, and whether the agent responsible for  
214 commanding them is incoherent.

215 (19) *Judgements*

216  $J ::= P \text{ True} \mid P \text{ False} \mid I \text{ Commanded}_\alpha \mid I \text{ Satisfied}_\sigma \mid I \text{ unSatisfied}_\sigma \mid$   
 $(I, \dots, I) \text{ Inconsistent} \mid \alpha \text{ Incoherent}$

217 Some of the judgements are subscripted with  $\alpha$ , indicating the relevant  
 218 authority, and  $\sigma$  to represent the subject. Although technically redundant in  
 219 the current presentation, this notation can help clarify the intended agent  
 220 when it comes to commanding and satisfying an imperative.<sup>4</sup>

221 The judgement  $p$  True ( $p$  False) mean that  $p$  is judged to be true (false,  
 222 respectively). For complex propositions, we will assume that such judgements  
 223 behave in a way that corresponds to a classical logic for propositions.

224 The judgement “ $a$  Commanded $_{\alpha}$ ” means that authority  $\alpha$  has issued  
 225 the command  $a$ . The content of the commands is assumed to be highly  
 226 ‘inscriptional’ in nature: even if  $b$  True follows from  $a$  True, it does not mean  
 227 that  $b$  Commanded $_{\alpha}$  necessarily follows from  $a$  Commanded $_{\alpha}$ .

228 The judgement “ $a$  Satisfied $_{\sigma}$ ” means that subject  $\sigma$  has satisfied the (pu-  
 229 tative) command  $a$ . We assume that  $a$  Satisfied $_{\sigma}$  (and indeed  $a$  unSatisfied $_{\sigma}$ )  
 230 does *not* imply or presuppose  $a$  Commanded $_{\alpha}$ . This allows us to consider  
 231 entailments between satisfaction conditions without giving rise to any inap-  
 232 propriate entailments concerning what has actually been commanded.<sup>5</sup>

233 The judgement “ $a$  unSatisfied $_{\sigma}$ ” means that subject  $\sigma$  has *not* satisfied the  
 234 (putative) command  $a$ . We aim to be neutral as to whether “ $a$  Satisfied $_{\sigma}$ ” and  
 235 “ $a$  unSatisfied $_{\sigma}$ ” are *contradictory* as opposed to being merely *contrary*. Being  
 236 contrary, then it should not be possible to maintain both “ $a$  Satisfied $_{\sigma}$ ” and  
 237 “ $a$  unSatisfied $_{\sigma}$ ” simultaneously (23). If they were also contradictory, then all  
 238 imperatives would have to be satisfied, or not satisfied. It can be argued that  
 239 this is not the necessarily the case. The command (20) is clearly satisfied if  
 240 the bill is paid within the twenty-one days. It is unsatisfied if no payment is  
 241 made by the end of the twenty-one days.

242 (20) “*Pay this bill within twenty-one days!*”

243 But within the twenty-one days, while the bill remains unpaid, we might  
 244 wish to maintain that (20) is not (yet) “satisfied” nor “unsatisfied”. There  
 245 is perhaps a debate to be had about the most appropriate terminology to  
 246 describe such notions unambiguously.

247 The judgement “ $I_1, \dots, I_n$  Inconsistent” indicates that the imperatives  
 248 are inconsistent. The intuition is that if  $I_1, \dots, I_n$  were translated into

<sup>4</sup>In this account we do not explicitly represent the intended recipient of a command. Where relevant, it can be assumed that the authority  $\alpha$  is expecting subject  $\sigma$  to comply.

<sup>5</sup>Given that  $a$  Satisfied $_{\sigma}$  does not presuppose there was a command  $a$  Commanded $_{\alpha}$ , it follows that  $a$  Satisfied $_{\sigma}$  cannot mean that a command was *intentionally* satisfied: there may have been no such command. Satisfaction is then an ‘extensional’ notion, that can be contrasted with the intensional, or inscriptional, flavour of  $a$  Commanded $_{\alpha}$ . Additional machinery would be required if it were necessary to distinguish between intentional and incidental satisfaction of a command.

249 propositions, either directly or by way of their satisfaction criteria, they  
 250 would be inconsistent with each other, in the sense that if the corresponding  
 251 propositions were all true together, they would allow the derivation of any  
 252 proposition.

253 The final judgement, “ $\alpha$  Incoherent”, is used to indicate that authority  $\alpha$   
 254 seeks to impose inconsistent commands. We assume that a rational authority  
 255 would seek to avoid issuing commands that give rise to a judgement of  
 256 incoherence. But the logic should be able to cope with an incoherent authority.

257 **A Reduction** We could try to reduce *satisfaction* of an imperative  $a$  to  
 258 *truth* of a propositional analogue  $a'$  of that imperative, with an implicit  
 259 subject  $\sigma$ . In particular,  $a$  Satisfied $_{\sigma}$  could be reduced to  $a'_{\sigma}$  True. We  
 260 could go further, and have imperatives  $a$  belong directly to the category  
 261 of propositions, making  $a$  Satisfied $_{\sigma}$  a notational variant of  $a_{\sigma}$  True. Both  
 262 of these moves will be avoided in the current account in order to leave  
 263 open the possibility of alternative notions of satisfaction, for example where  
 264 satisfaction is characterised directly by actions rather than propositions. It  
 265 also allows us to maintain a clear ontological distinction between imperatives  
 266 and propositions.<sup>6</sup>

#### 267 2.1.4. Abbreviation for Systems of Commands

268 It is helpful to have a notation for representing a system of commands, not  
 269 just individual commands. This can be used to represent a context in which  
 270 a collection of commands are to be considered together, as in §2.2.3. For  
 271 this purpose we will use  $\Sigma$  to refer to the collection of commands  $a_1, \dots, a_n$ ,  
 272  $\Sigma$  Commanded $_{\alpha}$  to represent the judgement that all these commands have  
 273 indeed been commanded, and  $\Sigma$  Satisfied $_{\sigma}$  to represent the judgement that  
 274 they have been satisfied (21).

- 275 (21) (a) “ $\Sigma$ ” stands for “ $a_1, \dots, a_n$ ”.  
 276 (b) “ $\Sigma$  Commanded $_{\alpha}$ ” stands for “ $a_1$  Commanded $_{\alpha}, \dots, a_n$  Commanded $_{\alpha}$ ”.  
 277 (c) “ $\Sigma$  Satisfied $_{\sigma}$ ” stands for “ $a_1$  Satisfied $_{\sigma}, \dots, a_n$  Satisfied $_{\sigma}$ ”.

278 No temporal ordering or precedence is intended when we write  $a_1, \dots, a_n$ .

## 279 2.2. Rules

280 The rules governing core aspects of the behaviour of imperatives are given  
 281 using rules of the form (22) over judgements  $J$  (19).

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<sup>6</sup>This is not to say that no reduction from imperatives to propositions is possible.

282 (22) 
$$\frac{J_1 \dots J_n}{J}$$

283 Essentially, (22) expresses the claim that judgement  $J$  follows from the  
 284 judgements  $J_1, \dots, J_n$ .

285 In some cases we initially give rules that characterise a generally un-  
 286 controversial core behaviour, followed by stronger rules that may be more  
 287 contentious.

### 288 2.2.1. Satisfaction

289 We use  $I \text{ Satisfied}_\sigma$  and  $I \text{ unSatisfied}_\sigma$  to express the judgements that impera-  
 290 tive  $I$  has been satisfied, or not, by subject  $\sigma$ . As previously noted (cf. §2.1.3),  
 291 we do not seek to reduce notion of satisfaction to something else, such as a  
 292 propositional description of a state, or an action. All that is required is for  
 293 there to be such a notion for every imperative, even if the satisfaction criteria  
 294 are not actually realisable in some cases.

295 It would be inconsistent to assert that the same imperative had both been  
 296 satisfied and not satisfied.<sup>7</sup>

297 (23) 
$$\frac{a \text{ Satisfied}_\sigma \quad a \text{ unSatisfied}_\sigma}{\perp}$$

298 While  $a \text{ Satisfied}_\sigma$  and  $a \text{ unSatisfied}_\sigma$  are contrary, we wish to avoid  
 299 requiring that they be contradictory. This means that it is sometimes necessary  
 300 to formulate rules for both the positive and negative cases explicitly, as in  
 301 (24).

302 As mentioned before (2.1.3), here judgements of the form  $a \text{ Satisfied}_\sigma$ ,  
 303 and  $a \text{ unSatisfied}_\sigma$ , do *not* presuppose or imply  $a \text{ Commanded}_\alpha$ .

304 **Conjunction** Conjunction is subject to the expected rules for satisfaction.  
 305 Both conjuncts must be satisfied for their conjunction to be satisfied. The  
 306 conjunction is judged to be unsatisfied if either conjunct is not satisfied.

307 (24) *Conjunction*  
 308 (a) 
$$\frac{a \text{ Satisfied}_\sigma \quad b \text{ Satisfied}_\sigma}{(a \wedge b) \text{ Satisfied}_\sigma}$$

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<sup>7</sup>For a specific theory of satisfaction it is appropriate to ensure that there are no counter-  
 intuitive results, including those that lead to formal inconsistency of judgements, and the  
 derivation of  $\perp$ . We do not do so here; the proposed rules are intended only to exemplify  
 the general approach (cf. §2.5).

$$\begin{array}{l}
309 \quad (b) \frac{a \text{ unSatisfied}_\sigma}{(a \wedge b) \text{ unSatisfied}_\sigma} \quad (c) \frac{b \text{ unSatisfied}_\sigma}{(a \wedge b) \text{ unSatisfied}_\sigma} \\
310 \quad (d) \frac{(a \wedge b) \text{ Satisfied}_\sigma}{a \text{ Satisfied}_\sigma} \quad (e) \frac{(a \wedge b) \text{ Satisfied}_\sigma}{b \text{ Satisfied}_\sigma} \\
311 \quad (f) \frac{(a \wedge b) \text{ unSatisfied}_\sigma \quad a \text{ Satisfied}_\sigma}{b \text{ unSatisfied}_\sigma} \\
312 \quad (g) \frac{(a \wedge b) \text{ unSatisfied}_\sigma \quad b \text{ Satisfied}_\sigma}{a \text{ unSatisfied}_\sigma}
\end{array}$$

313 **Free Choice** The core behaviour of free-choice disjunction is given by the  
314 rules in (25), where the disjunction is satisfied if either one of the disjunctions  
315 is satisfied (and the other is not), and is not satisfied if both are not satisfied.

316 (25) *Basic Free Choice*

$$\begin{array}{l}
317 \quad (a) \frac{a \text{ Satisfied}_\sigma \quad b \text{ unSatisfied}_\sigma}{(a \vee_{FC} b) \text{ Satisfied}_\sigma} \quad (b) \frac{a \text{ unSatisfied}_\sigma \quad b \text{ Satisfied}_\sigma}{(a \vee_{FC} b) \text{ Satisfied}_\sigma} \\
318 \quad (c) \frac{a \text{ unSatisfied}_\sigma \quad b \text{ unSatisfied}_\sigma}{(a \vee_{FC} b) \text{ unSatisfied}_\sigma} \\
319 \quad (d) \frac{(a \vee_{FC} b) \text{ Satisfied}_\sigma \quad b \text{ unSatisfied}_\sigma}{a \text{ Satisfied}_\sigma} \\
320 \quad (e) \frac{(a \vee_{FC} b) \text{ Satisfied}_\sigma \quad a \text{ unSatisfied}_\sigma}{b \text{ Satisfied}_\sigma} \\
321 \quad (f) \frac{(a \vee_{FC} b) \text{ unSatisfied}_\sigma}{a \text{ unSatisfied}_\sigma} \quad (g) \frac{(a \vee_{FC} b) \text{ unSatisfied}_\sigma}{b \text{ unSatisfied}_\sigma}
\end{array}$$

322 We can strengthen this core behaviour by adopting an exclusive inter-  
323 pretation of free-choice, where satisfying both disjuncts leads to an explicit  
324 failure to satisfy the free-choice imperative.

325 (26) *Explicitly Exclusive Free Choice*

$$\begin{array}{l}
326 \quad (a) \frac{a \text{ Satisfied}_\sigma \quad b \text{ unSatisfied}_\sigma}{(a \vee_{FC} b) \text{ Satisfied}_\sigma} \quad (b) \frac{a \text{ unSatisfied}_\sigma \quad b \text{ Satisfied}_\sigma}{(a \vee_{FC} b) \text{ Satisfied}_\sigma} \\
327 \quad (c) \frac{a \text{ unSatisfied}_\sigma \quad b \text{ unSatisfied}_\sigma}{(a \vee_{FC} b) \text{ unSatisfied}_\sigma} \quad (d) \frac{a \text{ Satisfied}_\sigma \quad b \text{ Satisfied}_\sigma}{(a \vee_{FC} b) \text{ unSatisfied}_\sigma} \\
328 \quad (f) \frac{(a \vee_{FC} b) \text{ unSatisfied}_\sigma \quad b \text{ Satisfied}_\sigma}{a \text{ Satisfied}_\sigma} \\
329 \quad (g) \frac{(a \vee_{FC} b) \text{ unSatisfied}_\sigma \quad a \text{ Satisfied}_\sigma}{b \text{ Satisfied}_\sigma}
\end{array}$$

330 This captures the intuition that both *going to the beach* and *playing in the*  
 331 *park* would not satisfy the exclusive interpretation of (4) “*Go to the beach or*  
 332 *play in the park!*”.

333 In contrast, an inclusive free-choice is supported explicitly by (27).

334 (27) *Explicitly Inclusive Free Choice*

$$335 \quad (a) \frac{a \text{ Satisfied}_\sigma}{(a \vee_{FC} b) \text{ Satisfied}_\sigma} \quad (b) \frac{b \text{ Satisfied}_\sigma}{(a \vee_{FC} b) \text{ Satisfied}_\sigma}$$

$$336 \quad (c) \frac{a \text{ unSatisfied}_\sigma \quad b \text{ unSatisfied}_\sigma}{(a \vee_{FC} b) \text{ unSatisfied}_\sigma}$$

337 **Negation** The judgements of  $a \text{ Satisfied}_\sigma$  and  $a \text{ unSatisfied}_\sigma$  are exclusive.

338 (28) *Negation*

$$339 \quad (a) \frac{a \text{ Satisfied}_\sigma}{(\neg a) \text{ unSatisfied}_\sigma} \quad (b) \frac{a \text{ unSatisfied}_\sigma}{(\neg a) \text{ Satisfied}_\sigma}$$

$$340 \quad (c) \frac{(\neg a) \text{ Satisfied}_\sigma}{a \text{ unSatisfied}_\sigma} \quad (d) \frac{(\neg a) \text{ unSatisfied}_\sigma}{a \text{ Satisfied}_\sigma}$$

341 This does not mean that satisfaction is bivalent; there may be satisfaction  
 342 gaps. We could have a double negation rule, so  $(\neg \neg a) \text{ Satisfied}_\sigma$  if and only  
 343 if  $a \text{ Satisfied}_\sigma$  (similarly for  $(\neg \neg a) \text{ unSatisfied}_\sigma$ ).

344 **Conditionals** Initially we give a very weak analysis of conditional impera-  
 345 tives. As conditionals have propositional content, the rules that govern them  
 346 involve judgements of truth, in addition to satisfaction.

347 (29) *Conditionals*

$$348 \quad (a) \frac{p \text{ True} \quad a \text{ Satisfied}_\sigma}{(p \rightarrow a) \text{ Satisfied}_\sigma} \quad (b) \frac{p \text{ True} \quad p \text{ unSatisfied}_\sigma}{(p \rightarrow a) \text{ unSatisfied}_\sigma}$$

$$349 \quad (c) \frac{p \text{ True} \quad (p \rightarrow a) \text{ Satisfied}_\sigma}{a \text{ Satisfied}_\sigma} \quad (d) \frac{p \text{ True} \quad (p \rightarrow a) \text{ unSatisfied}_\sigma}{a \text{ unSatisfied}_\sigma}$$

350 We may wonder whether preventing the antecedent  $p$  from becoming true  
 351 may count as satisfaction of the imperative. Such a view would justify (30).

352 (30) *Indirect Satisfaction of Conditionals*<sup>8</sup>

$$353 \quad (a) \frac{p \text{ False}}{(p \rightarrow a) \text{ Satisfied}_\sigma} \quad (b) \frac{(p \rightarrow a) \text{ Satisfied}_\sigma \quad a \text{ unSatisfied}_\sigma}{p \text{ False}}$$

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<sup>8</sup>Arguably the second of these rules falls under the remit of §2.2.2, which considers truth judgements.

354 In some cases it might seem perverse, but consider (10) “If you hit John,  
355 then apologise!”, which might be interpreted as an indirect command to avoid  
356 hitting John.

357 **Contra-positives** Further strengthenings, and extensions, may be sug-  
358 gested by considering *contra-positives*. In classical logic  $p \rightarrow q$  is equivalent  
359 to its contra-positive  $\neg q \rightarrow \neg p$ . In the case of imperatives, we might want  
360 to reflect on (31).<sup>9</sup>

- 361 (31) (a) “If it is not daytime, don’t turn out the light”  
362 (b) “Turn out the light only if it is daytime”

363 These support the view that it may be appropriate to allow contra-positive  
364 forms, so  $I_c$  includes  $I_b \rightarrow P$  (15) with satisfaction conditions that support  
365 (32).

- 366 (32)  $(a \rightarrow p)$  Satisfied <sub>$\sigma$</sub>  iff  $(\neg p \rightarrow \neg a)$  Satisfied <sub>$\sigma$</sub>

367 We can argue that for conditional imperatives there is another notion of  
368 contra-positive with respect to satisfaction, as follows.

- 369 (33)  $(p \rightarrow a)$  Satisfied <sub>$\sigma$</sub>  if either  
370 (a) if  $p$  True then  $a$  Satisfied <sub>$\sigma$</sub>   
371 (b) if  $a$  unSatisfied <sub>$\sigma$</sub>  then  $p$  False.

372 Here, (33b) has the form of the contra-positive of (33a). The first disjunct  
373 (33a) is already captured by (29a) and (33b) is captured by (30b).

374 **Pseudo-Or** Disjunctive pseudo-imperatives have the same satisfaction cri-  
375 teria as their imperative constituent.

- 376 (34) *Pseudo-Or*  
377 (a)  $\frac{a \text{ Satisfied}_\sigma}{(a \vee p) \text{ Satisfied}_\sigma}$  (b)  $\frac{a \text{ unSatisfied}_\sigma}{(a \vee p) \text{ unSatisfied}_\sigma}$   
378 (c)  $\frac{(a \vee p) \text{ Satisfied}_\sigma}{a \text{ Satisfied}_\sigma}$  (d)  $\frac{(a \vee p) \text{ unSatisfied}_\sigma}{a \text{ unSatisfied}_\sigma}$

---

<sup>9</sup>Example (31) is based on an example due to [anonymous in this draft]. We may wish to reflect on the extent to which it is possible to represent *permission* by way of contra-positive and free-choice imperatives.

### 379 2.2.2. Truth

380 Finally we can consider the judgements of truth. Such judgements are required  
381 for the analysis of pseudo-imperatives and conditional imperatives.

382 (35) *Standard Connectives*: As for classical logic.

383 (36) *Pseudo-And*

$$384 \quad (a) \frac{(a \wedge p) \text{ True} \quad a \text{ Satisfied}_\sigma}{p \text{ True}}$$

$$385 \quad (b) \frac{a \text{ Satisfied}_\sigma \quad p \text{ True}}{(a \wedge p) \text{ True}} \quad (c) \frac{a \text{ Satisfied}_\sigma \quad p \text{ False}}{(a \wedge p) \text{ False}}$$

386 (37) *Pseudo-Or*

$$387 \quad (a) \frac{(a \vee p) \text{ True} \quad a \text{ unSatisfied}_\sigma}{p \text{ True}}$$

$$388 \quad (b) \frac{p \text{ True}}{(a \vee p) \text{ True}} \quad (c) \frac{a \text{ Satisfied}_\sigma}{(a \vee p) \text{ True}}$$

389 Note that here we talk of a pseudo-imperative *being true* (or *being false*)  
390 rather than *being asserted* (or *commanded*).<sup>10</sup>

391 Conjunctive pseudo-imperatives do not make any claim about whether  
392 the imperative component needs to be satisfied for the propositional conjunct  
393 to be true. From  $(a \wedge p) \text{ True}$  and  $a \text{ unSatisfied}_\sigma$  we would not wish to infer  
394  $p \text{ False}$ .

395 As with propositional conditionals, we may still be interested in deciding  
396 what can and should be inferred in the case that the “antecedent” imperative  
397 conjunct is not satisfied. If it behaves like material implication, then we  
398 would have the following:

399 (38) *Strong Derivation of Pseudo-And*

$$400 \quad \frac{a \text{ unSatisfied}_\sigma}{(a \wedge p) \text{ True}}$$

401 Pragmatically, it is not clear that such a pseudo-imperative would actually be  
402 asserted under these circumstances. Arguably the assertion of a conjunctive  
403 pseudo-imperative has some form of causative or counter-factual component  
404 in its meaning. This is not considered here.

405 The initial rules for Pseudo-Or (34) do not say anything about the truth  
406 of propositional component in the event that the imperative component is

---

<sup>10</sup>Pseudo-imperatives might be issued even if the relevant truth conditions are not satisfied. In such cases they could be characterised as “empty” threats or promises.

407 satisfied. To address this, we could have a “committed” version of Pseudo-Or  
 408 (39) for which the propositional outcome will be averted in the event that  
 409 the imperative is satisfied.

$$410 \quad (39) \textit{ Committed Pseudo-Or}$$

$$411 \quad \frac{(a \vee p) \text{ True} \quad a \text{ Satisfied}_\sigma}{p \text{ False}}$$

412 In this case, the rules for Pseudo-Or introduction (37b,c) can be replaced by  
 413 those of (40).

$$414 \quad (40) \textit{ Introduction of Committed Pseudo-Or}$$

$$415 \quad (a) \frac{a \text{ Satisfied}_\sigma \quad p \text{ False}}{(a \vee p) \text{ True}} \quad (b) \frac{a \text{ unSatisfied}_\sigma \quad p \text{ True}}{(a \vee p) \text{ True}}$$

$$416 \quad (c) \frac{a \text{ Satisfied}_\sigma \quad p \text{ True}}{(a \vee p) \text{ False}}$$

### 417 2.2.3. Inconsistency and Incoherence

418 Here we present rules concerning judgements about the *consistency* of com-  
 419 mands and *coherence* authorities. These notions can be used to capture some  
 420 of the intuitions about incoherent combinations of commands. They can be  
 421 seen to correspond to a very weak form of validity. For example, although  
 422 we do not require that  $a \text{ Commanded}_\alpha$  follows from  $(a \wedge b) \text{ Commanded}_\alpha$   
 423 (cf. 1.1), we can say that it is *incoherent* of an authority to command  $\neg a$  at  
 424 the same time as commanding  $(a \wedge b)$ .

425 In general, the satisfaction conditions of some putative commands can be  
 426 at odds with the satisfaction of others. It would be inconsistent for them to be  
 427 judged to be satisfied together. In such cases, the corresponding commands  
 428 would be inconsistent with each other, that is,  $(a_1, \dots, a_n) \text{ Inconsistent}$ , or  
 429  $\Sigma \text{ Inconsistent}$  (2.1.4). This is formulated in (41), using the abbreviations  
 430 given in §2.1.4.

$$431 \quad (41) \quad \frac{[\Sigma \text{ Satisfied}_\sigma]}{\perp}$$

$$\Sigma \text{ Inconsistent}$$

432 An alternative would be for the inconsistency of the commands themselves  
 433 to be treated as a basic notion. It would then be inconsistent to claim such  
 434 commands were all satisfied together (42).

$$435 \quad (42) \quad \frac{\Sigma \text{ Inconsistent} \quad \Sigma \text{ Satisfied}_\sigma}{\perp}$$

436           Whichever approach we take, there should be no *logical* difficulties in rep-  
 437           resenting and making judgements about inconsistent collections of commands,  
 438           *provided* that we avoid asserting that some mutually inconsistent commands  
 439           are judged to have been satisfied.<sup>11</sup> It would however be incoherent for an  
 440           authority to issue inconsistent commands (43).

441           (43) *Incoherent agents*  
 442                    
$$\frac{\Sigma \text{Commanded}_\alpha \quad \Sigma \text{Inconsistent}}{\alpha \text{ Incoherent}}$$

443           An authority will be judged incoherent for doing any of the following:

- 444           (a) issuing a conjunctive command in which the conjuncts are inconsistent.  
 445           (b) giving a free choice over things they have prohibited  
 446           (c) issuing a conditional command in which the imperative consequent is  
 447                inconsistent with other commands, in the event the antecedent is true.  
 448           (d) issuing a pseudo-imperative where the imperative constituent is inconsis-  
 449                tent with other commands.

450           These follow as a consequence of the satisfaction criteria given in §2.2.1.

451           We may wish to strengthen the treatment of coherence of conditional  
 452           imperatives so that a conditional ( $p \rightarrow a$ ) with a consequent  $a$  that is  
 453           inconsistent with other commands is itself inconsistent regardless of the truth  
 454           of the antecedent proposition  $p$ .

455           (44) *Strong Consistency for Conditionals*  
 456                    
$$\frac{\Sigma \text{Commanded}_\alpha \quad (p \rightarrow a) \text{ Commanded}_\alpha \quad (\Sigma, a) \text{ Inconsistent}}{\alpha \text{ Incoherent}}$$

457           This goes someway towards capturing the intuition that (9) “*If you see John,*  
 458           *say hello!*” would be inconsistent with a command not to say hello to anyone.  
 459           We might prefer to say that a commanding authority could only be judged  
 460           incoherent if  $p$  were *possible*.

### 461           2.3. Obedience

462           We may judge that some form of *transgression* ( $\mathcal{T}$ ) arises in the event that  
 463           authority  $\alpha$  has commanded something that subject  $\sigma$  has failed to satisfy  
 464           [2, 9, 38].

---

<sup>11</sup>If  $a \text{ Satisfied}_\sigma$  were reduced to  $a_\sigma \text{ True}$  (§2.1.3), then this could be expressed directly in terms of classical consistency of propositions.

$$(45) \text{ Transgression}$$

$$\frac{a \text{ Commanded}_\alpha \quad a \text{ unSatisfied}_\sigma}{\mathcal{T}_{\sigma,\alpha,a}}$$

Here the transgression  $\mathcal{T}$  is indexed with the subject, the authority, and the command that has been transgressed. A more sophisticated analysis would be required if it were necessary to distinguish between intentional and co-incidental compliance. If a system of authority is inconsistent, it may not even be possible to comply. Here we do not consider the question of *when* the satisfaction of a command is to be evaluated.

A subject  $\sigma$  who is obedient with respect to authority  $\alpha$  will seek to minimise the number of transgressions, perhaps with a pragmatic value-judgement in the case of an inconsistent authority, or conflicts between authorities. Similar value-judgements could no doubt be employed to determine appropriate actions in the case of free-choice permission, and disjunctive pseudo-imperatives.

This notion of a transgression might provide a suitable vehicle for a pragmatic re-interpretation of validity with respect to formal and informal specifications, as used in computer science for example. In effect, the account proposed here gives specifications an intensional, or inscriptional, characterisation which avoids a logical collapse when considering a specification that contains inconsistencies [1, p123], whilst allowing partial fulfilment of a specification.

## 2.4. Sequential Commands

One variety of command not considered so far is that of sequential commands of the form “*Do a and then do b!*” [34]. We may formulate this as in (46).

(46) (a) Add  $a \wedge_T b$  to the language of imperatives, to represent “*and then*”.

(b) *Initial Coherence*

$$\frac{(a \wedge_T b) \text{ Commanded}_\alpha \quad \neg a \text{ Commanded}_\alpha}{\alpha \text{ Incoherent}}$$

(c) *Consequent Coherence (Strong)*

$$\frac{(a \wedge_T b) \text{ Commanded}_\alpha \quad \neg b \text{ Commanded}_\alpha}{\alpha \text{ Incoherent}}$$

(d) *Consequent Coherence (Weak)*

$$\frac{a \text{ Satisfied}_\sigma \quad (a \wedge_T b) \text{ Commanded}_\alpha \quad \neg b \text{ Commanded}_\alpha}{\alpha \text{ Incoherent}}$$

- 496 (e) *Satisfaction*
- 497 (i)  $\frac{(a \wedge_T b) \text{ Satisfied}_\sigma}{a \text{ Satisfied}_\sigma}$       (ii)  $\frac{(a \wedge_T b) \text{ Satisfied}_\sigma}{b \text{ Satisfied}_\sigma}$
- 498 (iii)  $\frac{a \text{ Satisfied}_\sigma \text{ AND THEN } b \text{ Satisfied}_\sigma}{(a \wedge_T b) \text{ Satisfied}_\sigma}$

499 This assumes some appropriate interpretation of “AND THEN” in the language  
500 of judgements.

501 A more refined approach could be to add a temporal dimension to systems  
502 of commands and their satisfaction, thus providing the means to formalise  
503 dynamic command systems.

## 504 2.5. Models for Imperative Theories

505 A model can be constructed in order to help demonstrate the consistency  
506 of any specific proposed collection of inference rules. In the case of the  
507 framework proposed here, one approach would be to model the propositions  
508  $P$  and imperatives  $I$ , and the operators that can combine them, as classes of  
509 terms in a combinatory calculus. Closure rules would then need to be given  
510 to reflect the syntax of  $P$  and  $I$ . Further classes and closure rules could then  
511 be added to model the judgements.

512 If appropriately constructed, the interpretation and the closure rules  
513 would demonstrate that there is a consistent interpretation of the proposed  
514 collection of inference rules. Producing a model-theoretic interpretation can  
515 help to demonstrate that a formal system is coherent. But, a model of this  
516 sort does not necessarily contribute directly to the *understanding* of the  
517 framework or the intuitions about the subject matter. Although important,  
518 here we view model-theory as playing a secondary, supporting role to the  
519 formal framework.

## 520 3. Imperative Dilemmas

521 It is appropriate to discuss some of the dilemmas described in the literature  
522 on imperatives, and demonstrate how they can be addressed within this  
523 proposed framework.

### 524 3.1. Ross’s Paradox

525 By appealing to some seemingly contrary intuitions about the appropriate  
526 rules for a logic of imperatives, Ross [31] argued that it is not possible to

527 formulate a logic for imperatives with inference rules that individually capture  
528 both the notions of satisfaction and validity.

529 The core of Ross's case can be illustrated by considering disjunction. If  
530 we take classical logic to be the gold standard of *validity*, then given the  
531 proposition  $p$  we should be able to infer  $(p \vee q)$ , where  $q$  is any proposition.  
532 If this particular notion of validity is carried over directly into a "logic" of  
533 imperatives, then if  $a$  is commanded, we can infer that  $(a \vee b)$  is commanded,  
534 where  $b$  is any imperative. But, Ross argues, from (47) we probably do not  
535 want to derive the command (48) as the satisfaction criteria of the latter  
536 would licence the burning of the letter, which presumably the commanding  
537 authority may consider undesirable.

538 (47) "*Post the letter!*"

539 (48) "*Post the letter or burn the letter!*"

540 This tension is resolved in the current account by maintaining a clear  
541 distinction between judgements concerning *satisfaction* and those concerning  
542 what has been *commanded*. Furthermore, the rules governing commands are  
543 very weak. This allows the main thrust of Ross's argument to be avoidable:  
544 we do not need to assume that notions of validity apply to the content of  
545 commands. Classical validity can apply to judgements themselves without  
546 necessarily applying directly to commands, or their content. If there is  
547 a judgement that supports something closely resembling classical patterns  
548 of inferences, it is that of *satisfaction*. Some problems are avoided if we  
549 acknowledge that the judgement of satisfaction does not require or presuppose  
550 that a command was issued.

### 551 3.2. Free Choice

552 In the case of free-choice imperatives [3, 8, 21, 39] (§1.2), a key issue is that  
553 we appear to be "permitted" to comply with either command, but at the same  
554 time may only be allowed to comply with one. In the proposed account, the  
555 sense in which the free-choice imperative appears to licence both disjuncts  
556 is captured by the fact that it is incoherent to command something that  
557 contradicts (or whose satisfaction criteria contradicts) either of them. The  
558 exclusive interpretation is captured by ruling that the free-choice command  
559 is "satisfied" if *and only if* one disjunct is satisfied (26).

### 560 3.3. Jørgensen's Dilemma

561 The essence of Jørgensen's Dilemma [20] is as follow: (a) logical inferences  
562 only hold between sentences with truth values; (b) imperatives have no truth

563 values; therefore, (c) there should be no logical inferences between imperatives.  
 564 And yet, (d) it still appears compelling to argue that imperatives do support  
 565 some kind of logical entailment, as in (49). The dilemma is that the conclusion  
 566 (c) and observation (d) appear to be at odds with one another.

- 567 (49) (a)  $\frac{\text{“Keep your promises”} \quad \text{“This is a promise”}}{\therefore \text{“Keep this promise”}}$   
 568 (b)  $\frac{\text{“Love your neighbour as you love yourself”} \quad \text{“Love yourself”}}{\therefore \text{“Love your neighbour”}}$

569 The dilemma can be resolved if we take inferences involving propositions (50)  
 570 to be short-hand for inferences over *truth judgements* about propositions (51).

- 571 (50)  $\frac{p_1 \quad p_2 \quad \dots \quad p_n}{p}$   
 572 (51)  $\frac{p_1 \text{ True} \quad p_2 \text{ True} \quad \dots \quad p_n \text{ True}}{p \text{ True}}$

573 The claim (a) can then be generalised, and restated as “*logical inferences*  
 574 *only hold between judgements*”. On this view, we *can* then have entailments  
 575 involving expressions that do not have truth values—such as imperatives—  
 576 provided that we identify the relevant judgements. For imperatives, the  
 577 relevant judgements are those of *satisfaction* and *commanding* rather than  
 578 *truth* [5]. In the current proposal, we seek to avoid one source of confusion  
 579 by making explicit the intended nature of such judgements.

580 Even if otherwise satisfied by the current proposal’s resolution of Jör-  
 581 gensen’s Dilemma, the inquisitive reader may question what the proposal  
 582 makes of the specific examples in (49). The theory as formalised in §2 does  
 583 not capture these entailments from general expressions to specific expression.  
 584 Even so, one can see that the arguments would appear to follow when couched  
 585 in terms of satisfaction. In the case of (49a) if the imperative is satisfied and  
 586 the proposition true in the premises, then the conclusion “*Keep this promise*”  
 587 is satisfied; if it is not, then either the propositional premise is false, or the  
 588 imperative premise is not satisfied. In the case (49b), if both premises are  
 589 satisfied, then the conclusion “*Love your neighbour*” is satisfied; if it is not,  
 590 then at least one of the premises cannot have been satisfied.

591 From the perspective of what has been *commanded*, the current account  
 592 would not allow us to infer that the commands in the conclusions of (49)  
 593 are judged to have been issued, although it would not be incoherent for an  
 594 authority to highlight the consequences of satisfying a command by issuing  
 595 the more specific imperatives.

#### 4. Related Work

The “standard approach” to the formal analysis of imperatives [18] is to take imperatives to have some “propositional content” [15, 20, 26, 35]. Some accounts also factor-in the agent, or addressee [29].

The current proposal avoids any direct reduction of imperatives to propositions. Instead, it treats imperatives as first class entities. Judgements about their satisfaction criteria are taken to have the same status as judgements of truth in the case of propositions. This notion of “satisfaction” corresponds to “fulfilment” criteria [5, 16, 24] or “outcomes” [12].

Some accounts include a specific notion of an action which is intimately related to a proposition [37, 25, 30, 34]. For example, the proposition may be the *post-condition* of the action. The imperative is then a request to perform this action in order for the desired post-condition to become true. But it should be noted that actions, however formulated, need to take account of intent, not just post-conditions. A person who hangs a piece of bread in the water on a hook can only be described as engaging in the act of fishing if that is what she intends to do, regardless of whether or not she catches fish [14], or exactly how she goes about it.

The proposed framework abstracts away from any particular notion of satisfaction, such as an action-based analysis. This allows core aspects of the inferential behaviour of imperatives to be considered while avoiding questions about actions, causality, events, intentions, the frame problem [27] and the relationship between actions and events [4]. The framework can be enriched with actions and events if that is thought appropriate.

It is common to adopt a *model-theoretic* methodology for semantic analysis. With such an approach, the primary task would be to provide an interpretation of imperatives in a model [25, 34]. Any representation language would then have only a secondary role. This can be contrasted with the current proposal, which seeks to provide a framework in which intuitions about inference behaviour are formulated more directly. An argument in favour of this approach is that it makes it easier for us to work at an appropriate level of abstraction. We can focus on the intuitions, rather than working around the technical difficulties that can arise when formulating a theory primarily as an “encoding” in some pre-existing model. The approach taken here also seems to make it easier to maintain a classical notion of inference, and avoid the need to adopt some form of defeasible entailment [3].

There are alternative formalisations that model imperatives in terms of “commitments” or “to do” lists [28, 29]. There is a sense in which these can be seen to be capturing the notion of satisfaction, and treating what has been

635 commanded as something that need not be subject directly to any substantive  
636 rules of entailment.

637 There appear to be no other existing proposals that combine: (a) an  
638 explicit and unambiguous distinction between commanding and satisfying;  
639 (b) the avoidance of logical dilemmas in the face of incoherent commands;  
640 (c) consideration of conditional and pseudo imperatives; (d) a treatment of  
641 the permissive aspects of free-choice imperatives which does not resort to  
642 defeasible inference.

## 643 5. Conclusions and Future Work

644 The primary role of this contribution is to present a framework for formalising  
645 intuitions about the basic patterns of behaviour of judgements concerning  
646 imperatives. Some sample rules are proposed. The account could be extended  
647 to include quantification, discourse phenomena [25], pragmatic issues, and the  
648 relationship with deontic logic [13]. It may also be appropriate to find some  
649 way of unifying, or relating, those patterns of behaviour that are common to  
650 both *truth* and *satisfaction*.

651 It might be argued that the current formalisation provides a mere *descrip-*  
652 *tion* of the patterns of behaviour of imperatives, and that only those accounts  
653 that seek to integrate an analysis of imperatives within some pre-existing  
654 model can properly claim to count as a fully-fledged explanatory *theory*. Such  
655 a claim may be seen to be reinforced if the appropriate patterns of behaviour  
656 are obtained as a ‘natural’ consequence of some definitional reduction of  
657 imperatives to other independently motivated notions.

658 A counter-argument is that the identification of appropriate ontological  
659 categories and judgements, and the formalisation of patterns of behaviour  
660 into precise rules, is an important and necessary step. Such an analysis can  
661 be used to determine whether a proposed reduction preserves our intuitions.  
662 This approach also allows us to work at an appropriate level of abstraction,  
663 and avoids the risk of conflating intuitively distinct ontological categories.

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671

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