- Event-Related and Object-Related Readings.
- (1)a. Four thousand ships passed through the lock last year. b. The library lent out 23,000 books in 1987. c. Sixty tons of radioactive waste were transported through the lock last year. d. The dry cleaners cleaned 5.7 million bags of clothing in 1987. e. 12,000 persons walked through the turnstile yesterday.
- object-related reading, says that there are four thousand ships which passed through the lock last year.
- event-related reading, says that there were four thousand events of passing through the lock by a ship last year. Page: 2.
- Two Possible Analyses - And Why They Fail.
- Gupta (1980) and Carlson (1982).
- (2)a. National Airlines served at least two million passengers in 1975.
- identity criteria of passenger and person differ.
- Gupta's.
- common nouns apply not to individuals, but to individual concepts,.
- Carlson's.
- it is common for a pitcher to face 35 or so batters from a team consisting of only nine members.
- person applies to objects, whereas a noun like batter applies to stages of objects.
- both Gupta and Carlson locate the eventrelated reading in the meaning of a noun.
- But we observed the event-related reading also with nouns like ship, book, radioactive waste, clothing, person in (I), Page: 3.
- claim that a noun like ship is indeed ambiguous and denotes either ships or, say, ship stages,.
- But then our way of counting breaks down: we have suddenly at least three stages, s,, s2, and the sum of sl and s2, which passed through the lock.
- radioactive waste carried to and fro need not always come in the same ships,.
- A New Solution.
- couched in a more general framework for the semantics of mass nouns, count nouns, measure constructions, and temporal constitution (i.e., aspectual classes), which was developed in Krifka (1986, to appear).
- an algebraic (lattice-theoretic) semantics, as developed by Link (1983),.
- event semantics developed by Davidson (1967) and Parsons (1980).
- theory of measurement.
- In Section (2), I will outline this framework as far as it is necessary to understand my analysis of event-related readings.
- In Section (3), I will present two versions of this analysis, the second of which is semantically somewhat more complicated, but more in agreement with the syntactic structure. Comments from page 3 continued on next page.
- In Section (4), I will go into some cases which seem to pose special problems for at least one of the two analyses.
- coordi Page: 4.
- nation, quantifiers, comparison, anaphora, and phase nouns.
- 2.1. Lattice Sorts.
- to treat phenomena like the semantics of mass terms and plural terms, we have to assume that the universe of entities of a sort has a certain structure, which we will call lattice sort. Page: 7.
- (5) Lattice Sorts: a. Objects: 0 , with Uo, Go, Co, 00, variables u, u' . . . b. Events: E with UE, CE, CE, OE, variables e, e' . . . 0 and E are disjoint: i3x[O(x) A E(x)].
- we can specify the cumulative reference property.
- if we have, say, two entities which are ships, then their join is again an entity which is ships.
- the quantized reference property.
- an entity which is four thousand ships, then it does not have a proper subpart which is again four thousand ships. Page: 8.
- 2.2. Measure Functions on Lattices.
- measure function is a function from concrete entities to abstract entities such that.
- preserve an empirical relation in an arithmetical relation.
- extensive measure functions.
- concatenation, which is reflected in the arithmetical addition.
- define the notion of measure functions compatible with a lattice sort as measure functions whose domain is a subset of the lattice sort, which are positive, which can be extended to parts, and which are additive with respect to the join.
- diamond Page: 9.
- We can show that we can build quantized predicates.
- (8) If p is a measure function compatible with a lattice sort C and n is a number, then QUAz(hx[p(x) = n]).
- Assume to the contrary that hx[p(x) = n] is not quantized,.
- Because of the distributivity of the lattice sort, there is a unique complement x3 of x2.
- We arrive thus at the contradiction p(xl) = n and p(xl) > n.
- If we interpret ton as a measure function compatible with the object lattice, Page: 10.
- To handle count noun constructions in the same way, we have to assume that they have a measure function built into their semantic representation.
- I assume that the singularlplural distinction is a pure syntactic agreement phenomenon.
- A TREATMENT OF OBJECT-RELATED AND EVENT-RELATED READINGS.
- tackle the explanation of the readings of our examples in (1).
- 3.1. The Object-Related Reading Page: 11.
- event relation.
- AuAe[pass-through-the-lock' (e,u)].
- O[NP/N] AQARAe3u[R(e,u) A Q(u)].
- Consider the two ships Candida and Eleonore, which are represented by the objects Candida' and Eleonore', Page: 12.
- (13)a. ship1(Candida') = 1 b. ship1(Eleonore') = 1 c. pasathrougkthe-lockl(el, Candida') d. pass-through-the_lock1(e2, Eleonore') e. pass-through-the-lock1(e3, Eleonore') f. pass-through-the-lock' is summative g. shipl(Candida' Uo Eleonore') = 2.
- In (ll), we only have derived an event predicate as a semantic representation of our example sentence. Let us call the syntactic category which represents that stage of the derivation the sentence radical.

- Sentence radicals can be transformed into sentences by sentence mood operators. For example, the declarative operator takes an event predicate and yields a formula.
- Here, I simply assume that the declarative operator existentially binds the event variable of the meaning of the sentence radical. Page: 13.
- 3.2. The Event-Related Reading, First Approach.
- construct the new measure function p from the meaning of pass through the lock and the meaning of ship?.
- standardized.
- under certain circumstances, the object-related reading and the event-related reading.
- coincide,.
- call these circumstances non-iterative models of n ships pass through the lock.
- generalized by claiming additivity.
- passing through the lock of n + n' ships.
- An event e is called iterative with respect to some event relation R if there is an object u which stands in R-relation to at least two different parts of e:.
- OEM which takes a measure relation and an event relation and yields the measure function for events Page: 15.
- If p is applied to an event e which is non-iterative with respect to the event relation, it gives us the number of ships which passed through the lock in e.
- By additivity (ii), then, p yields a value for the join of the events el, e2, . . . , em as well.
- el UE e2 UE e3 is an iterative event with respect to the event relation.
- whether the standardization rule and the generalization rule are in conflict with each other. Page: 16.
- check whether the induced measure function is as general as it should be.
- The definition of the object-induced event measure function covers measures on matter as well, as the notion of iterativity applies to matter in the same way as it applies to objects.
- tons is first applied to radioactive waste, so that the number argument remains unbound.
- From a purely syntactic standpoint, however, four thousand clearly forms a constituent with ships.
- different ways to get a semantic representation which is more in tune with the ordinary syntactic structure. One is to raise the type of the number word so that it takes a count noun relation and an event relation. Page: 17.
- The general idea of the second approach is this: We construct from the meaning of the verbal predicate alone,.
- Both the construction of the measure function and the specification of the value is built into the meaning of a special determiner,.
- the values of the measure function cannot be ordinary numbers; they are predicate extensions instead.
- define a suitable addition operation in a lattice sort,.
- In prose: The 'sum' of the sets P and P' is the set of all elements which consist of two nonoverlapping parts which are elements of P and P', respectively.
- Let us call quantized predicates degrees, and +2 degree addition.
- the addition oper Page: 18.
- we obviously have to guarantee that there are enough entities of the right sort in the universe.
- if we reconstruct degrees in an intensional model structure as properties and define degree addition as 'property addition'.
- degree addition then should yield the function which maps every possible world to the set of entities which consist of nine thousand ships.
- we would like to claim in any case that the intensions of, say, 9000 ships and 10000 ships is different,.
- only a measure relation, as the 'value' of the measure is not uniquely determined.
- the 'value' of the measure can be either four thousand ships, four thousand watercraft, Page: 19.
- new operation OEMR, for Object-induced Event Measure Relation.
- difference from the object-related reading is that the nominal predicate four thousand ships is combined with another determiner.
- has two functions: first, it builds up the desired measure relation for events, and second, it specifies the 'value' of this measure relation Page: 20.
- If the first argument of a is an event e which is non-iterative with respect to the relation pass-through-the-lock', then P can specify the number of ships which passed through the lock in e.
- By additivity, as claimed in rule (ii), a then relates the join of the events el, e2, . . . , em to the quantized predicate PI +, p2 So a + a So Prn. Page: 21.
- I want to point out an interesting phenomenon in the interpretation of sentences involving measure functions, which can be called pragmatic maximalization.
- true even if, actually, more than four thousand ships passed.
- 4.1. Coordinated Degrees.
- One way is to trace them back to coordinated sentences.
- A less clumsy analysis is possible with the second approach. First, we have to define a conjunction for predicates based on the join operation. Page: 22.
- In the object-related reading, it simply applies to an object which consists of three thousand freight barges and one thousand yachts, and claims that such an object passed through the lock.
- 4.2. Comparison Constructions Page: 23.
- the comparative semantics of Seuren (1973).
- In prose: There is a number n such that n freight barges passed through the lock (in the event-related reading), but it is not the case that n yachts passed through the lock (in the event-related reading).
- (37)a. Most ships passed through the lock at night.
- (37a) can either mean that more than half of the ships (of a given domain of entities) passed through the lock during the night. Or it can mean that more than half of the lock traversals of a ship occurred at night. Page: 24.
- Generalized Quantifier theory (cf. Barwise and Cooper 1981.
- Let max(P) be the maximal number n such that P(n) is true.
- quantified NPs similarly to the other NPs,.
- when combined with an event relation, yields an event predicate.
- event predicate MXT, which applies to the maximal event of the reference time,.
- the event which contains every event which occurred during the reference time. Page: 25.

- We get an event predicate which applies to the maximal event (of the reference time) in case this event contains an event which is the passing of more than half of the ships.
- Now let us look at the event-related readings Page: 26.
- how to represent the focus of an expression.
- I will pursue a variant of the structured representation approach here.
- (P, a, a), with P a semantic representation of the background with a free occurence of the variable a, and a a semantic representation of the focus, which is of the same type as the variable a. Page: 27.
- process of focusation, which is marked by capitalization and indicated in the syntactic representation by brackets indexed with f.
- projection operators BC, FC and VR, yielding the background, the focus and the variable of a structured representation,.
- BC((P,a,a))=P, Page: 29.
- This predicate applies to maximal events e with the property that the proportion of the maximal number n such that n ships passed through the lock at night (event-related interpretation) in e to the maximal number n such that n ships passed through the lock (also event-related interpretation) in e is greater than i.
- most ships in this representation has properties of both a nominal and an adverbial quantifier.
- cannot simply rely on numbers to determine the proportions in these cases.
- must invoke some appropriate dimension.
- 4.4. Problems of Anaphora Page: 30.
- (46)a. Four thousand ships passed through the lock last year. They transported radioactive waste.
- They in (46a) does not refer to an entity which is overtly introduced in the preceding sentence. Instead, it refers to an entity which is conventionally related to an entity which is introduced in the preceding sentence.
- (47) There was an old car standing in front of the house. The windshield was broken.
- The NP they in the second sentence, then, refers to the ships related to e,.
- we would have to explain in the case of (46a) why we can refer with a pronoun (as opposed to a full NP).
- the concept of ships is introduced,.
- 4.5. Phase Nouns.
- (48)a. Two million passengers were served by National Airlines in 1975. b. Two million persons were served by National Airlines in 1975. Page: 31.
- assume that (48a) indeed has two readings as well, but that they have the same truth conditions.
- we can analyze passenger as a measure function compatible with some lattice sort which yields the value 1 if applied to one person-during-asingleevent- of-transportation.
- both ways of measuring - by counting the passengers, or by counting noniterative acts of transportations of one passenger - necessarily yield the same results.
- phase nouns represent the reverse direction of the induction of measurement functions we have considered so far.
- We have seen that it is possible to give a semantic analysis of eventrelated meanings of the sentences in (1) in terms of measure functions (or relations) on events which are induced by the measure functions on ob Page: 32.
- many more examples which show that the derivation of one measure from another measure.
- container measures,.
- the notion of objects x contained in other objects y can be captured by a function which maps x to its container y.
- second case consists of distance expressions with movement verbs,.
- (51) walk ten kilometers Page: 33.
- could be the existence of a separate and flexible module in our cognitive system which is specialized for gradation and measurement.
- .