ATIS Axioms as Extended from SIGGS

Prepared by: Kenneth R. Thompson
Head Researcher
System Predictive Technologies
2096 Elmore Avenue
Columbus, Ohio 43224-5019

Submitted as Part of the
Proffitt Grant Research “Analysis of Patterns in Time and Configuration”
Theodore W. Frick, Principal Investigator
Associate Professor and Web Director
School of Education
Indiana University
Bloomington, Indiana

© Copyright 1996 to 2005 by Kenneth R. Thompson, Systems Predictive Technologies, 2096 Elmore Avenue, Columbus, Ohio 43224-5019;
All rights reserved. Intellectual materials contained herein may not be copied or summarized without written permission from the author.
Presented in this report are the 201 axioms of the SIGGS Theory as cited in Development of Educational Theory Derived from Three Educational Theory Models. These axioms provide the initial axioms for an Axiomatic (General Systems) Theory of Intentional Systems. Formalizations of these axioms are also included.

Many of the SIGGS axioms had previously been deleted from various treatments of SIGGS as they were stated in a way that they were specific to education systems. However, ATIS accounts for all axioms initially listed for SIGGS, extended the properties that had been listed in SIGGS and also introduced the Warden Subsystems. The extension of the properties has increased their number from the 73 SIGGS properties to 136 contained in the ATIS development. The number of properties will continue to be extended as required.

With these new developments, the education axioms could then be generalized to any intentional system.

In addition to the substantive extensions of SIGGS, new nomenclature that facilitates the recognition and interpretation of the various properties has also been provided. Most properties will fall into one of seven categories shown below in Primary Property Categories. While an example of each property is given in this listing, a complete list of the properties for each category is provided in ATIS Properties, Report #6 of this series.

While this list presents the axioms that have been taken directly from SIGGS, there will be various refinements with the development of ATIS, which will be provided in a separate report. These reports will be required since some of the axioms herein presented are actually theorems, and some have been found not to be valid, and then there will be numerous additional axioms required in order to account for new properties that have been added, or to extend the axioms required to fully explicate the properties from SIGGS.

---

1 Maccia, Elizabeth Steiner and George S. Maccia (1966), Development of Educational Theory Derived from Three Educational Theory Models, The Ohio State University, Research Foundation, Columbus, Ohio.
Primary Property Categories

\(\mathcal{A}\) designates the affect relation properties; e.g., \(\sigma^d \mathcal{A}\) designates “directed affect relation.”

\(\mathcal{B}\) designates the behavior properties; e.g., \(\sigma^s \mathcal{B}\) designates “dispositional behavior.”

\(\mathcal{C}\) designates the connected properties; e.g., \(\mathcal{C}_{\text{HA}}\) designates “heterarchy.”

\(\mathcal{F}\) designates the “feed-" transmission properties; e.g., \(\mathcal{F}_{\text{I}}\) designates “feedin.”

\(\mathcal{F}\) designates the filtration properties; e.g., \(\mathcal{F}_{\text{S}}\) designates “system-filtration.”

\(\mathcal{X}\) designates the morphism properties; e.g., \(\mathcal{X}_{\text{E}}\) designates “endomorphism.”

\(X_p\) designates the “-put” properties; e.g., \(T_p\) designates “to-put.”

\(\mathcal{S}\) designates the system state properties; e.g., \(\mathcal{S}_{\text{DV}}\) designates “developing states.”

\(\mathcal{S}\) designates the system properties; e.g., \(\mathcal{S}_{\text{SR}}\) designates “(system) strain.”

\(\mathcal{W}\) designates the Warden Partition Properties; e.g., \(\mathcal{W}_{\text{S}}\) designates “strategic system.”
Nomenclature

To facilitate the reading of the formalization of the axioms, the following nomenclature has been developed.

\( X^\uparrow \) designates that property \( X \) is increasing.

\( X^\downarrow \) designates that property \( X \) is decreasing.

\( X^c \) designates that property \( X \) is constant.

\( X_{\text{min}} \) designates that the value of property \( X \) is minimum.

\( X_{\text{max}} \) designates that the value of property \( X \) is maximum.

\( \approx \) designates an approximate value.

\( X_{\approx_{\text{min}}} \) designates that the value of property \( X \) is close to minimum value.

\( X_{\approx_{\text{max}}} \) designates that the value of property \( X \) is close to maximum value.

\( \Delta X \) designates change in property \( X \).

\( X^{+\alpha}_{1} \) designates that \( X \) increases to \( \alpha \) at time \( 1 \).

\( t_1 \) is equivalent to \( t(1) \) and designates time at point one.

\( \wedge \) designates logical “and.”

\( \vee \) designates logical “or.”

\( \supset \) designates logical “implies.”

\( \equiv \) designates logical “if and only if,” or equivalence of sets.

\( \sim \) designates logical “not.”

\( \forall \) designates logical universal quantifier “for all.”

\( \exists \) designates logical existential quantifier “there exists.”

\( \exists^1 \) designates logical existential quantifier “there exists exactly one.”

\( \exists^n \) designates logical existential quantifier “there exist \( n \).”

\( \sim\exists^{n+1} \) designates logical existential quantifier “there exist at most \( n \).”

\( \iota \) designates logical description quantifier “that” or “the.”

\( \hat{w} \) designates the class quantifier “the class of \( w \).”

\( (X \mid y) \) designates that property \( X \) is qualified by \( y \), and is read “\( X \) given \( y \)” or “\( X \) restricted by \( y \),”

\( X_A \) designates the referent family of affect relations of system \( X \).

\( yA \) designates the \( y \) affect relation set.
Designation of Behavioral Affect Relations

The Behavioral Affect Relations are those relations in which at least one component is human. The interpretation of such affect relations is system-specific. That is, while the initial application of SIGGS was to an educational system, such affect relations are applicable to any human component-type system. SIGGS introduced ten different types of behavioral affect relations as generalized below. The name of the affect relation is followed in parentheses by the nomenclature that will be used in the formalization of the axioms. One additional relation, ‘control’, is introduced that will be required in the development of ATIS.

Control (C): Affect Relations defined by components of a Subsystem that are related to other components in a manner defined to be “control.”

Development Inquiry (D): Affect relations defined by components of the Human Component Control Subsystem of the Leadership Subsystem that are related to other components in a manner defined to be “developmental inquiring.”

Expert (E): Affect relations defined by components of the Population Subsystem that are related to other components in a manner defined to be “expert.”

Facilitating (F): Affect relations defined by components of the Infrastructure Subsystem that are related to other components in a manner defined to be “facilitating.”

Inquiry (Q): Affect relations defined by components of the Leadership Subsystem that are related to other components in a manner defined to be “inquiring.”

Instructional (I): Affect relations defined by components of the Leadership Subsystem that are related to other components in a manner defined to be “instructional.”

Legitimate (L): Affect relations defined by components of the Organic Essential Subsystem that are related to other components in a manner defined to be “legitimate.”

Punishment (P): Affect Relations defined by components of the Fielded Military Subsystem that are related to other components in a manner defined to be “punishing.”

Referent (R): Specified affect relations.

Research Inquiry (S): Affect relations defined by components of the Human Component Intelligence Subsystem of the Leadership Subsystem that are related to other components in a manner defined to be “research inquiring.”

Reward (W): Affect Relations defined by components of the Dynamic Teleological Subsystem of the Leadership Subsystem that are related to other components in a manner defined to be “rewarding.”

Support (U): Affect Relations defined by components of a Subsystem that are related to other components in a manner defined to be “support.”
Axiom List

[The numbers of the axioms refer to their listing in Steiner and Maccia.]

1. If system environmental change increases, then change in system input is greater than some value.
2. If system environmental change increases, then change in fromput is greater than some value.
3. If system environmental change increases, then change in feedback is greater than some value.
4. If system environmental change increases, then change in filtration is greater than some value.
5. If system toput increases, then input increases to some value and then decreases.
6. If system toput greater than some value increases, then fromput increases.
7. If system toput approaches minimum, then fromput increases.
8. If system toput increases, then filtration decreases to some value and then increases.
9. If system toput increases, then regulation less than some value increases.
10. If system input decreases, then fromput decreases.
11. If system input decreases, then storeput decreases.
12. If system input increases, then filtration decreases.
13. If system input decreases, then filtration increases.
14. If system input is greater than some value, then regulation is greater than some value.
15. If system output increases, then fromput increases.
16. If system storeput decreases, then feedout decreases.
17. If system storeput increases, then adaptability increases.
18. If system storeput increases, then efficiency decreases.
19. If system feedin increases, then fromput increases to some value and then decreases.
20. If system feedin increases, then spillage increases.
21. If system feedthrough increases, then compatibility increases.

22. If system feedthrough is less than some value, then filtration is greater than some value or spillage is greater than some value.

23. If change in system feedback is greater than some value, then system environmental change increases.

24. If system feedback is greater than some value, then storeput is less than some value.

25. If system feedback is greater than some value, then regulation is less than some value.

26. If system filtration is greater than some value, then compatibility is greater than some value.

27. If system is filtration less than some value, then compatibility is less than some value.

28. If system filtration increases, then adaptability increases.

29. If system openness increases, then efficiency decreases.

30. If system environmental change increases and fromput increases, then change in feedout is greater than some value.

31. If system environmental change increases and fromput increases, then change in feedthrough is greater than some value.

32. If system environmental change is greater than some value and feedthrough is greater than some value, then stability is greater than some value.

33. If system toput increases and fromput increases, then feedthrough increases.

34. If system toput is constant and efficiency is greater than some value, then regulation is less than some value.

35. If system input is constant and fromput is constant, then output is constant.

36. If system input increases and storeput is constant, then feedout increases.

37. If system input increases and storeput is less than some value, then change in input equals change in storeput.

38. If change in system input is greater than change in feedthrough, then spillage increases.

39. If system input is greater than some value and spillage is less than some value, then storeput increases.

40. If system input is less than some value and spillage is less than some value, then storeput decreases.
41. If system input is constant and efficiency at a given time is less than some value, then efficiency increases.

43. If system fromput increases and output is less than some value, then feedout decreases.

44. If change in system fromput is less than some value and change in storeput is less than zero and change in fromput is greater than zero and the negative of change in storeput is greater than some value, then efficiency decreases.

45. If system output increases and feedback is greater than some value, then input increases.

47. If system feedthrough is greater than some value and spillage is less than some value and feedback is greater than some value, then efficiency is greater than some value.

48. If system (feedin increases and feedout is constant and compatibility is constant) or (feedin is constant and feedout increases and compatibility is constant) or (feedin is constant and feedout is constant and compatibility decreases), then openness increases.

49. If system (feedin decreases and feedout is constant and compatibility is constant) or (feedin is constant and feedout decreases and compatibility is constant) or (feedin is constant and feedout is constant and compatibility increases), then openness decreases.

50. Change in system input is greater than change in fromput.

51. Change in system feedin is greater than change in feedout.

52. System efficiency is equal to the maximum efficiency if and only if feedin is equivalent to feedout.

53. If system complete-connectivity increases, then flexibility increases.

55. If strongness increases, then hierarchical-order decreases.

56. If strongness increases, then flexibility increases.

57. If unilateralness, then hierarchical-order.

58. If disconnectivity is greater than some value, then independence increases.

59. If disconnectivity is greater than some value, then segregation increases.

60. If vulnerability increases, then complete-connectivity decreases.

61. If passive-dependence increases, then centrality increases.

62. If active-dependence increases, then centrality decreases.

63. If interdependence increases, then complexity-growth increases.
64. If hierarchical-order increases, then vulnerability increases and flexibility decreases.

65. If compactness increases, then hierarchical-order decreases.

66. If centrality increases, then passive-dependence increases.

67. If centrality increases, then active-dependence decreases.

68. If centrality is less than some value, then independence increases.

69. If centrality is less than some value, then centrality increases.

70. If wholeness increases and hierarchical-order is constant, then integration increases.

71. The limit of the ratio of active-dependence to passive-dependence as unilateralness increases is equal to 1.

72. If system maximum passive-dependence is with respect to Leadership Subsystem affect relations; then wholeness increases, and hierarchical-order increases, and centrality increases.

73. If system strongness is with respect to Leadership Subsystem affect relations; then there is complete-connectivity with respect to referent affect relations.

74. If system strongness is with respect to referent affect relations; then vulnerability with respect to Leadership Subsystem affect relations decreases.

75. If system strongness is with respect to referent affect relations; then vulnerability with respect to referent affect relations decreases.

76. If system strongness with respect to reward affect relations is greater than some value; then complete-connectivity with respect to referent affect relations increases, or strongness with respect to referent affect relations increases.

77. If system strongness with respect to reward affect relations is greater than some value; then wholeness is with respect to Leadership Subsystem affect relations, and hierarchical-order is with respect to Leadership Subsystem affect relations.

78. If system strongness with respect to Leadership Subsystem affect relations increases, and hierarchical-order with respect to Leadership Subsystem affect relations decreases; then strongness with respect to referent affect relations increases.

79. If system strongness with respect to referent affect relations is greater than some value, and hierarchical-order with respect to Leadership Subsystem affect relations is greater than some value, then wholeness is with respect to Leadership Subsystem affect relations.

80. If system strongness with respect to referent affect relations is less than some value, and centrality is with respect to Leadership Subsystem affect relations; then wholeness is with respect to Leadership Subsystem affect relations.
81. If system \texttt{strongness} with respect to referent affect relations is less than some value, and \texttt{hierarchical-order} with respect to Leadership Subsystem affect relations is greater than some value, and \texttt{centrality} is with respect to Leadership Subsystem affect relations; then \texttt{compactness} with respect to Leadership Subsystem affect relations increases.

82. If system \texttt{wholeness} is with respect to referent affect relations; then \texttt{complete-connectivity} with respect to referent affect relations increases, or \texttt{strongness} with respect to referent affect relations increases.

83. If system \texttt{hierarchical-order} with respect to Leadership Subsystem affect relations is greater than some value, and \texttt{flexibility} with respect to Leadership Subsystem affect relations is greater than some value; then \texttt{disconnectivity} is with respect to referent affect relations.

84. There is \texttt{disconnectivity} greater than some value with respect to instructional affect relations.

85. There is \texttt{disconnectivity} greater than some value with respect to inquiry affect relations.

86. If system \texttt{state-steadiness} is greater than some value, then \texttt{strain} increases.

87. If system \texttt{stress} is less than some value, then \texttt{state-steadiness} is constant.

88. If system \texttt{stress} greater than some value increases, then \texttt{strain} increases.

89a. System \texttt{state-steadiness} increases if and only if \texttt{state-determinacy} increases.

89b. System \texttt{state-steadiness} decreases if and only if \texttt{state-determinacy} decreases.

90. If system \texttt{toput} increases, then \texttt{centrality} decreases.

91. If system \texttt{feedin} decreases, then \texttt{unilateralness} decreases.

92. If system \texttt{feedin} less than some value decreases, then \texttt{hierarchical-order} decreases.

93. If system \texttt{feedin} decreases, then \texttt{complexity-degeneration} increases.

94. If system \texttt{feedout} is less than some value, then \texttt{complexity-degeneration} increases.

95. If system \texttt{feedthrough} increases, then \texttt{weakness} is less than some value.

96. If system \texttt{toput} is close to minimum and \texttt{fromput} increases, then \texttt{disconnectivity} increases.

97. If system \texttt{feedin} increases and \texttt{compatibility} is close to minimum, then \texttt{disconnectivity} increases.

98. If system \texttt{storeput} increases, and \texttt{filtration} decreases or \texttt{spillage} decreases; then \texttt{integration} increases.

99. If system \texttt{input} increases, and \texttt{storeput} is greater than some value; then \texttt{segregation} is with respect to referent affect relations.
100. If system complete-connectivity increases, then feedin increases.

101. If system weakness is greater than some value, then feedthrough is less than some value.

102. If system interdependence increases, then feedin increases.

103. If system wholeness increases, then regulation is less than some value.

104. If system compactness greater than some value increases, then efficiency increases.

105. If system centrality increases, then toput decreases.

106. If system complete-connectivity increases or strongness increases, then toput increases.

107. If system complete-connectivity increases or strongness increases, then input increases.

108. If system complete-connectivity increases or strongness increases, then filtration decreases.

109. If system complete-connectivity increases or strongness increases, then spillage increases.

110. If system complete-connectivity increases or strongness increases, then change in fromput, and change in fromput is less than change in input.

111. If system complete-connectivity increases or strongness increases, then change in storeput is greater than change in fromput.

112. If system strongness increases and hierarchical-order is constant, then regulation decreases.

113. If system wholeness increases and hierarchical-order is constant, then efficiency decreases.

114. If system weakness and hierarchical-order, then flexibility decreases.

115. If system unilateralness, or weakness increases, or disconnectivity increases; then input decreases and fromput decreases.

116. If system passive-dependence with respect to reward affect relations increases, then feedout decreases.

117. If system passive-dependence with respect to reward affect relations increases, then adaptability greater than some value increases.

118. If system independence with respect to Leadership Subsystem affect relations increases, then fromput increases.

119. If system independence with respect to Leadership Subsystem affect relations increases, then output is less than some value.

120. If system independence with respect to Leadership Subsystem affect relations increases, then feedout decreases.
121. If system \textit{wholeness} with respect to \textit{referent affect relations} is greater than some value, then the absolute value of the difference of \textit{fromput} from maximum \textit{fromput} is greater than some value.

122. If system \textit{wholeness} with respect to \textit{referent affect relations} is greater than some value, then \textit{openness} approaches minimum.

123. If system \textit{hierarchical-order} with respect to \textit{Leadership Subsystem affect relations} increases, then \textit{filtration} increases.

124. If system \textit{complexity} with respect to \textit{facilitating affect relations} is greater than some value, then \textit{regulation} is greater than some value.

125. If system \textit{complexity} with respect to \textit{facilitating affect relations} is greater than some value, then \textit{feedthrough} with respect to \textit{facilitating affect relations} is less than some value.

126. If system \textit{passive-dependence} with respect to \textit{inquiry affect relations} and \textit{legitimate affect relations} increases, then \textit{feedout} increases and \textit{spillage} increases.

127. If system \textit{passive-dependence} with respect to \textit{inquiry affect relations} and \textit{expert affect relations} increases, then \textit{feedout} decreases and \textit{spillage} greater than some value increases.

128. If system \textit{active-dependence} with respect to \textit{facilitating affect relations} and \textit{legitimate affect relations} is greater than some value, then \textit{regulation} is less than some value.

130. If system \textit{disconnectivity} with respect to \textit{instructional affect relations} and \textit{referent affect relations} is greater than some value, and \textit{complete-connectivity} with respect to \textit{instructional affect relations} and \textit{referent affect relations} increases, and \textit{wholeness} with respect to \textit{instructional affect relations} and \textit{referent affect relations} increases; then \textit{input} increases, \textit{fromput} increases, \textit{feedout} decreases, and \textit{regulation} increases.

131. If system \textit{disconnectivity} is with respect to \textit{instructional affect relations} and \textit{expert affect relations} is greater than some value, \textit{complete-connectivity} is with respect to \textit{instructional affect relations} and \textit{expert affect relations} increases, and \textit{wholeness} with respect to \textit{instructional affect relations} and \textit{expert affect relations} increases; then \textit{input} increases, \textit{storeput} increases, \textit{feedout} increases, and \textit{filtration} increases.

132. If system \textit{disconnectivity} with respect to \textit{instructional affect relations} and \textit{referent affect relations} is greater than some value, \textit{passive-dependence} with respect to \textit{instructional affect relations} and \textit{referent affect relations} increases, and \textit{wholeness} with respect to \textit{instructional affect relations}, and \textit{referent affect relations} increases; then \textit{input} decreases, \textit{fromput} decreases, \textit{feedout} decreases, and \textit{regulation} decreases.
133. If system disconnectivity with respect to instructional affect relations and reward affect relations is greater than some value, passive-dependence with respect to instructional affect relations and reward affect relations increases, and wholeness with respect to instructional affect relations and reward affect relations increases; then if system environmental change is greater than some value, then adaptability is greater than some value, input is less than some value, storeput is less than some value, and filtration is greater than some value.

134. If system disconnectivity with respect to instructional affect relations and legitimate affect relations is greater than some value, passive-dependence with respect to instructional affect relations and legitimate affect relations increases, and wholeness with respect to instructional affect relations and legitimate affect relations increases; then feedout increases, spillage is greater than some value, and regulation is greater than some value.

135. If system disconnectivity with respect to instructional affect relations and punishment affect relations is greater than some value, passive-dependence with respect to instructional affect relations and punishment affect relations increases, wholeness with respect to instructional affect relations and punishment affect relations increases, and hierarchical-order with respect to instructional affect relations and punishment affect relations increases; then if system environmental change is greater than some value, then adaptability is less than some value, fromput decreases, feedout decreases, regulation decreases, stability increases, and equifinality increases.

136. If system maximum active dependence with respect to development inquiry affect relations and legitimate affect relations; then fromput is less than some value, filtration increases, spillage increases, regulation is less than some value, active-dependence with respect to inquiry affect relations decreases, and active-dependence with respect to instructional affect relations increases.

137. If system feedout is greater than some value and compatibility is less than some value, then segregation is less than some value.

138. If system toput increases and compactness greater than some value increases, then regulation increases.

139. If system toput increases and compactness greater than some value decreases, then efficiency decreases.

140. If system fromput is constant or decreases, complete-connectivity increases, and strongness increases; then feedthrough decreases.

141. If system toput increases, and independence with respect to Leadership Subsystem affect relations increases; then feedout increases.

142. If system feedback is greater than some value, passive-dependence is with respect to punishment affect relations, and active-dependence is greater than some value; then efficiency is greater than some value.

143. If system feedin is constant, then homeostasis is less than some value.
144. If system filtration decreases, then isomorphism increases.

145. If system filtration is greater than some value, then stability is greater than some value.

146. If system adaptability is greater than some value, then stability decreases.

147. If system toput increases and feedout approaches minimum, then stress increases.

148. If system environmental change is greater than some value, feedthrough is constant or less than some value, and feedback is greater than some value, then stability is less than some value.

149. If system filtration with respect to instructional affect relations increases, then isomorphism with respect to instructional affect relations increases.

150. If system automorphism increases; then input increases, storeput increases, fromput decreases, feedout decreases, filtration decreases, spillage decreases, and efficiency decreases.

151. If system isomorphism increases; then fromput decreases, and feedout decreases.

152. If system state-steadiness is greater than some value, then adaptability is less than some value.

153. If system state-determinacy increases, then regulation decreases.

154. If system equifinality is greater than some value, then regulation is less than some value.

155. If system equifinality is at a given time, and homeostasis is greater than some value; then regulation is less than some value.

156. If system isomorphism with respect to instructional affect relations increases; then fromput decreases, and feedout decreases.

157. If system toput increases, and size is constant; then feedback increases.

158. If system toput increases, fromput increases, and size is constant; then feedout increases.

159. If system environmental change is greater than some value, compatibility is greater than some value, and stability is greater than some value; then storeput is greater than some value, or filtration is greater than some value, or spillage is greater than some value.

160. If system output is constant, automorphism decreases, and homomorphism is greater than some value; then feedout decreases.

161. If system toput is less than some value, feedin increases, and stability is less than some value; then stability increases.
163. If system toput is greater than some value, feedin decreases, and stability is less than some value; then stability increases.

164. If system independence increases, then stability is less than some value.

165. If system flexibility decreases, then state-determinacy increases.

166. If system centrality increases, then state-steadiness increases.

167. If system complexity greater than some value increases, then size increases.

168. If system independence increases, and wholeness increases; then state-steadiness is greater than some value.

169. If system wholeness is greater than some value, and centrality is greater than some value; then state-determinacy is greater than some value.

170. If system centrality with respect to instructional affect relations increases, then isomorphism with respect to instructional affect relations increases.

171. If system disconnectivity with respect to facilitating affect relations is greater than some value, and wholeness with respect to facilitating affect relations is less than some value; then state-determinacy with respect to facilitating affect relations is less than some value.

172. If system automorphism increases, then wholeness decreases.

173. If system automorphism increases, then centrality decreases.

174. Change in system size is greater than change in hierarchical-order.

175. If system complexity-degeneration increases; then size-degeneration increases, or disconnectivity increases.

176. If system state-steadiness is less than some value; then segregation is less than some value, integration is less than some value, and homeostasis is less than some value.

177. If system weakness is maximum and size increases; then passive-dependence increases, or active-dependence increases.

178. If system hierarchical-order at a given time is greater than some value, and size at the given time is greater than some value; then independence at a later time increases.

179. If system size increases, and complexity-growth is constant; then vulnerability increases.

180. If system size increases, and complexity-growth is constant; then flexibility decreases.

181. If system size increases, and complexity-growth is constant; then centrality decreases.
182. If system size is constant, and complexity-degeneration increases; then disconnectivity increases.

184. If system complexity increases, and size-growth is constant; then compactness decreases.

185. If system complexity increases, and size-growth is constant; then centrality increases.

186. If system centrality increases, and stress is greater than some value; then stability decreases.

187. If system stress is equal to 0, and centrality increases; then stability increases.

188. If system size increases and complexity-growth is constant; then state-determinacy increases.

189. If system maximum active-dependence is with respect to research inquiry affect relations and legitimate affect relations; then input increases, fromput increases, storeput increases, filtration increases, and automorphism with respect to instructional affect relations increases.

190. If system homomorphism at time 2 is greater than homomorphism at time 1; then toput approaches maximum, size-degeneration approaches maximum, and complexity-degeneration approaches maximum.

191. If system efficiency is greater than some value, and compactness is greater than some value; then state-determinacy is greater than some value.

194. If system size increases, and complexity-growth is constant; then toput increases.

195. If system size increases, and complexity-growth is constant; then feedin decreases.

196. If system size increases, and complexity-growth is constant; then feedout increases, and change in feedout decreases.

197. If system size increases, and complexity-growth is constant; then feedthrough increases.

198. If system size increases, and complexity-growth is constant; then feedback decreases.

199. If system size increases, and complexity-growth is constant; then regulation increases to some value and then decreases.

200. If system size increases, and complexity-growth is constant; then compatibility decreases.

201. If system size increases, and complexity-growth is constant; then efficiency increases to some value and then decreases.
Formalization of ATIS Axioms

1. $\Delta S'^{\uparrow} \supset \Delta I_p > \alpha$
2. $\Delta S'^{\uparrow} \supset \Delta F_p > \alpha$
3. $\Delta S'^{\uparrow} \supset \Delta f_b > \alpha$
4. $\Delta S'^{\uparrow} \supset \Delta \mathcal{F}(S) > \alpha$
5. $T_p^{\uparrow} \supset \sigma(I_p^{\uparrow}\alpha:1, I_p^{\downarrow}\alpha:2) | \alpha > \beta$
6. $(T_p > \alpha)^{\uparrow} \supset F_p^{\uparrow}$
7. $T_p \approx 0 \supset F_p^{\uparrow}$
8. $T_p^{\uparrow} \supset \sigma(\mathcal{F}(S)^{\downarrow}\alpha:1, \mathcal{F}(S)^{\uparrow}\alpha:2) | \alpha < \beta$
9. $T_p^{\uparrow} \supset (\mathcal{F}(S) < \alpha)^{\uparrow}$
10. $I_p^{\downarrow} \supset F_p^{\downarrow}$
11. $I_p^{\downarrow} \supset S_p^{\downarrow}$
12. $I_p^{\uparrow} \supset \mathcal{F}(S)^{\downarrow}$
13. $I_p^{\downarrow} \supset \mathcal{F}(S)^{\uparrow}$
14. $I_p > \alpha \supset \mathcal{F}(S) > \beta$
15. $O_p^{\uparrow} \supset F_p^{\uparrow}$
16. $S_p^{\downarrow} \supset \mathcal{F}_o^{\downarrow}$
17. $S_p^{\uparrow} \supset \mathcal{A}S^{\uparrow}$
18. $S_p^{\uparrow} \supset \mathcal{E}F\mathcal{S}^{\downarrow}$
19. $f_l^{\uparrow} \supset \sigma(F_p^{\uparrow}\alpha:1, F_p^{\downarrow}\alpha:2) | \alpha > \beta$
20. $f_l^{\uparrow} \supset \mathcal{S}_p^{\downarrow}$
21. $f_t^{\uparrow} \supset \mathcal{E}(S)^{\uparrow}$
22. $f_t \prec \alpha \supset \mathcal{F}(S) > \beta \lor \mathcal{S}_p > \gamma$
23. $f_b > \alpha \supset \mathcal{S}_p > \beta$
24. $f_b > \alpha \supset S_p < \beta$
25. $f_b > \alpha \supset \mathcal{A}(S) < \beta$
26. $\mathcal{F}(S) > \alpha \supset \mathcal{E}(S) > \beta$
27. $\mathcal{F}(S) < \alpha \supset \mathcal{E}(S) < \beta$
28. $\mathcal{F}(S)^{\uparrow} \supset \mathcal{A}S^{\uparrow}$
29. $O\mathcal{S}^{\uparrow} \supset \mathcal{E}\mathcal{F}\mathcal{S}^{\downarrow}$
30. $\Delta S'^{\uparrow} \land F_p^{\uparrow} \supset \Delta f_0 > \alpha$
31. $\Delta S'^{\uparrow} \land F_p^{\uparrow} \supset \Delta f_t > \alpha$
32. $\Delta S' > \alpha \land f_t > \beta \supset \mathcal{S}_b \mathcal{S} > \gamma$
33. $T_p^{\uparrow} \land F_p^{\uparrow} \supset f_t^{\uparrow}$
34. $T_p \land \mathcal{E}\mathcal{F}\mathcal{S} > \beta \supset \mathcal{A}(S) < \gamma$
35. $I_p \land F_p \supset \mathcal{O}_p$
36. $I_p^{\uparrow} \land S_p^{\downarrow} \supset \mathcal{F}_o^{\uparrow}$
37. $I_p^{\uparrow} \land S_p < \alpha \supset \Delta I_p = \Delta S_p$
38. \( \Delta I_p > \Delta f_i \supset SP^\uparrow \)
39. \( I_p > \alpha \land SP^\downarrow \beta \supset S_p^\uparrow \)
40. \( I_p < \alpha \land SP^\downarrow \beta \supset S_p^\downarrow \)
41. \( I_p^c \land EF^\downarrow \beta \supset EF^\uparrow \)
42. \( F_p^\uparrow \land OP^\uparrow \alpha \supset f^\downarrow \)
43. \( (\Delta F_p < \alpha) \land (\Delta S_p < 0 < \Delta F_p) \land (\Delta S_p < \beta) \supset EF^\uparrow \)
44. \( (f^\uparrow < \alpha) \land (SP^\downarrow \beta) \land (f^\uparrow < \gamma) \supset EF^\uparrow \)
45. \( f^\uparrow \land fB > \alpha \supset I_p^\downarrow \)
46. \( (f^\uparrow \land f_B^c \land \overline{C(S)}^c) \lor (f^\uparrow \land f_B^c \land \overline{C(S)}^c) \lor (f^\uparrow \land f_B^c \land \overline{C(S)}^c) \supset O_S^\uparrow \)
47. \( (f^\uparrow \land f_B^c \land \overline{C(S)}^c) \lor (f^\uparrow \land f_B^c \land \overline{C(S)}^c) \lor (f^\uparrow \land f_B^c \land \overline{C(S)}^c) \supset O_S^\downarrow \)
48. \( (f^\uparrow \land f_B^c \land \overline{C(S)}^c) \lor (f^\uparrow \land f_B^c \land \overline{C(S)}^c) \lor (f^\uparrow \land f_B^c \land \overline{C(S)}^c) \supset O_S^\uparrow \)
49. \( (f^\uparrow \land f_B^c \land \overline{C(S)}^c) \lor (f^\uparrow \land f_B^c \land \overline{C(S)}^c) \lor (f^\uparrow \land f_B^c \land \overline{C(S)}^c) \supset O_S^\downarrow \)
50. \( \Delta I_p > \Delta F_p \)
51. \( \Delta f_i > \Delta f_0 \)
52. \( EP^\max := f^\uparrow \equiv f^\downarrow \)
53. \( CP^\uparrow \supset \overline{S}^\uparrow \)
54. \( \overline{S}^\uparrow \supset \overline{H}^\uparrow \)
55. \( \overline{S}^\uparrow \supset \overline{F}^\uparrow \)
56. \( \overline{S}^\uparrow \supset \overline{H}^\uparrow \)
57. \( \overline{U}^\uparrow \supset \overline{H}^\uparrow \)
58. \( \overline{D}^\uparrow > \overline{n} \supset \overline{I}^\uparrow \)
59. \( \overline{D}^\uparrow > \overline{n} \supset \overline{S}^\uparrow \)
60. \( v^\uparrow \supset \overline{C}^\downarrow \)
61. \( P^\uparrow \supset \overline{C}^\downarrow \)
62. \( \overline{A}^\uparrow \supset \overline{C}^\downarrow \)
63. \( \overline{l}^\uparrow \supset \{X(S)\}^\uparrow \)
64. \( \overline{H}^\uparrow \supset \overline{v}^\uparrow \land \overline{F}^\uparrow \)
65. \( \overline{C}^\uparrow \supset \overline{H}^\downarrow \)
66. \( \overline{C}^\uparrow \supset \overline{P}^\downarrow \)
67. \( \overline{C}^\uparrow \supset \overline{A}^\downarrow \)
68. \( \overline{C}^\uparrow < \overline{n} \supset \overline{l}^\uparrow \)
69. \( \overline{C}^\uparrow < \overline{n} \supset \overline{C}^\uparrow \)
70. \( \lim_{U^\uparrow \overline{A}^\uparrow / \overline{P}^\downarrow / \overline{C}^\uparrow} = 1 \)
71. \( \overline{S}^\uparrow \supset \overline{C}^\downarrow \supset \overline{C}^\uparrow \)
72. \( [PD^\max \mid L \overline{P}^\downarrow] \supset \overline{W}^\uparrow \land \overline{H}^\uparrow \supset \overline{C}^\uparrow \)
73. \( [S^\uparrow \mid L \overline{P}^\downarrow] \supset \overline{C}^\downarrow \)
74. \( \overline{S}^\downarrow \supset [V^\uparrow \mid L \overline{P}^\downarrow]^\uparrow \)
75. \( \overline{S}^\downarrow \supset [V^\downarrow \mid L \overline{P}^\downarrow]^\uparrow \)
76. \( [S^\uparrow \mid L \overline{A}^\downarrow] > \alpha \supset [CC^\downarrow \mid L \overline{A}^\downarrow] \lor [S^\uparrow \mid L \overline{A}^\uparrow] \)
77. \( [S^\uparrow \mid L \overline{A}^\uparrow] > \alpha \supset [W^\uparrow \mid L \overline{A}^\uparrow] \land [H^\uparrow \mid L \overline{A}^\uparrow] \)
78. \( [S^\uparrow \mid L \overline{A}^\uparrow] \land [H^\uparrow \mid L \overline{A}^\uparrow] \supset [S^\downarrow \mid L \overline{A}^\uparrow] \)
79. \( S_A^\uparrow > \alpha \land [H^\uparrow \mid L \overline{A}^\uparrow] \supset \beta \supset [W^\uparrow \mid L \overline{A}^\uparrow] \)

© Copyright 1996 to 2005 by Kenneth R. Thompson, Systems Predictive Technologies, 2096 Elmore Avenue, Columbus, Ohio 43224-5019; Site: www.Raven58Technologies.com. All rights reserved. Intellectual materials contained herein may not be copied or summarized without written permission from the author.
80. \([\delta A < \alpha] \land [c \delta A \mid L \vec{\delta} A] :\Rightarrow \mathcal{W}[\delta A]
81. \([\delta A < \alpha] \land [\delta \vec{\delta} A \mid L \vec{\delta} A] > \beta \land [c \delta A \mid L \vec{\delta} A] :\Rightarrow \mathcal{W}[\delta A]
82. \(\delta A \Rightarrow [c \delta A \mid L \vec{\delta} A] \lor [\delta A \mid L \vec{\delta} A]^\uparrow
83. \([\delta A \mid L \vec{\delta} A] > \alpha \land [\delta \vec{\delta} A \mid L \vec{\delta} A] > \beta :\Rightarrow \delta A
84. \(\delta \Rightarrow \alpha \mid \mathcal{A}
85. \(\delta \Rightarrow \alpha \mid \mathcal{A}
86. \(\delta \Rightarrow \alpha \Rightarrow \delta \Rightarrow \delta^c
87. \(\delta \Rightarrow \alpha \Rightarrow \delta \Rightarrow \delta^c
88. \(\delta \Rightarrow \alpha \Rightarrow \delta \Rightarrow \delta^c
89. \(\delta \Rightarrow \alpha \Rightarrow \delta \Rightarrow \delta^c
90. \(\delta \Rightarrow \alpha \Rightarrow \delta \Rightarrow \delta^c
91. \(\delta \Rightarrow \alpha \Rightarrow \delta \Rightarrow \delta^c
92. \(\delta \Rightarrow \alpha \Rightarrow \delta \Rightarrow \delta^c
93. \(\delta \Rightarrow \alpha \Rightarrow \delta \Rightarrow \delta^c
94. \(\delta \Rightarrow \alpha \Rightarrow \delta \Rightarrow \delta^c
95. \(\delta \Rightarrow \alpha \Rightarrow \delta \Rightarrow \delta^c
96. \(\delta \Rightarrow \alpha \Rightarrow \delta \Rightarrow \delta^c
97. \(\delta \Rightarrow \alpha \Rightarrow \delta \Rightarrow \delta^c
98. \(\delta \Rightarrow \alpha \Rightarrow \delta \Rightarrow \delta^c
99. \(\mathcal{I}_p \mid \mathcal{S}_p > \alpha \Rightarrow \delta \Rightarrow \delta^c
100. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
101. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
102. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
103. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
104. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
105. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
106. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
107. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
108. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
109. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
110. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
111. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
112. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
113. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
114. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
115. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
116. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
117. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
118. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
119. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
120. \(\mathcal{C} \Rightarrow \delta \Rightarrow \delta^c
121. $w_{\lambda} S_\alpha > \alpha \supset |F_p^{\text{max}} - F_p| > \beta$

122. $w_{\lambda} S_\alpha > \alpha \supset \delta_s^{\text{min}}$

123. $[\lambda H S_\lambda | L H S_\lambda] \supset \mathcal{A}(S)$

124. $[\chi(S) | f \mathcal{A}] > \alpha \supset \mathcal{A}(S) > \beta$

125. $[\chi(S) | f \mathcal{A}] > \alpha \supset [f_T | f \mathcal{A}] < \beta$

126. $[p_{\delta} S_\delta | Q \mathcal{A}] \uparrow \supset f_0 \uparrow \wedge S_p S_\delta$

127. $[p_{\delta} S_\delta | Q_0 \mathcal{A}] \uparrow \supset f_0 \downarrow \wedge (S_p S_\delta > \alpha)$

128. $[a_{\delta} S_\lambda | f \mathcal{A}] > \alpha \supset \mathcal{A}(S) < \beta$

130. $[d_{\delta} S_\lambda | f \mathcal{A}] > \alpha \wedge [c c S_\lambda | f \mathcal{A}] \uparrow \wedge [w_{\delta} S_\lambda | f \mathcal{A}] \uparrow \supset I_p \uparrow \wedge F_p \uparrow \supset f_0 \uparrow \wedge \mathcal{A}(S)$

131. $[d_{\delta} S_\lambda | f \mathcal{A}] > \alpha \wedge [c c S_\lambda | f \mathcal{A}] \uparrow \wedge [w_{\delta} S_\lambda | f \mathcal{A}] \uparrow \supset I_p \uparrow \wedge S_p \uparrow \supset f_0 \uparrow \wedge \mathcal{A}(S)$

132. $[d_{\delta} S_\lambda | f \mathcal{A}] > \alpha \wedge [p_{\delta} S_\lambda | f \mathcal{A}] \uparrow \wedge [w_{\delta} S_\lambda | f \mathcal{A}] \uparrow \supset [f_T | f \mathcal{A}] < \beta$

133. $[d_{\delta} S_\lambda | f \mathcal{A}] > \alpha \wedge [p_{\delta} S_\lambda | f \mathcal{A}] \uparrow \wedge [w_{\delta} S_\lambda | f \mathcal{A}] \uparrow \supset [f_T | f \mathcal{A}] < \beta$

135. $[d_{\delta} S_\lambda | f \mathcal{A}] > \alpha \wedge [p_{\delta} S_\lambda | f \mathcal{A}] \uparrow \wedge [w_{\delta} S_\lambda | f \mathcal{A}] \uparrow \supset [f_T | f \mathcal{A}] < \beta$

136. $[a_{\delta} S_\lambda | F_p \mathcal{A}] > F_p < \alpha \wedge \mathcal{A}(S) \uparrow \wedge S_p S_\delta$

137. $f_0 > n \wedge \mathcal{A}(S) < \alpha \supset \mathcal{A}(S) > \delta_s^{\text{min}}$

138. $T_p \uparrow \wedge (c p S_\delta > n) \supset \mathcal{A}(S) \uparrow$

139. $T_p \uparrow \wedge (c p S_\delta > n) \supset \mathcal{A}(S) \uparrow$

140. $(F_p \vee F_p') \wedge c c S_\delta \wedge S_\delta \supset f_0 \uparrow$

141. $T_p \uparrow \wedge [f_0 \uparrow | L H S_\lambda] \supset f_0 \uparrow$

142. $f_0 > \alpha \wedge [p_{\delta} S_\delta | f \mathcal{A}] \wedge a \wedge \mathcal{A}(S) > \beta \supset \mathcal{A}(S) > \gamma$

143. $f_0 \supset \alpha \supset \mathcal{A}(S) < \beta$

144. $\mathcal{A}(S) \supset f_0$

145. $\mathcal{A}(S) \supset \alpha \wedge \mathcal{A}(S) < \beta$

146. $\alpha \wedge \mathcal{A}(S) < \beta$

147. $T_p \uparrow \wedge f_0 \uparrow \alpha \supset \mathcal{A}(S)\uparrow$

148. $(\alpha > \alpha) \wedge (f_T \leq \beta) \wedge (f_B \gamma) \supset (\alpha \supset \mathcal{A}(S)\uparrow)$

149. $[s \mathcal{A} | f \mathcal{A}] \supset [f | f \mathcal{A}]$

150. $\mathcal{A}(S) \supset I_p \uparrow \wedge S_p \uparrow \wedge F_p \downarrow \supset f_0 \downarrow \wedge \mathcal{A}(S) \supset S_p \uparrow \wedge \mathcal{A}(S) \supset \mathcal{A}(S) \uparrow$

151. $f_0 \supset F_p \downarrow \wedge f_0 \downarrow$

152. $s \mathcal{A} \supset \alpha \supset \mathcal{A}(S) \supset \beta$

153. $d_{\delta} \mathcal{A} \supset \mathcal{A}(S) \uparrow$

154. $\mathcal{A}(S) \supset \mathcal{A}(S) \uparrow$

155. $e q \mathcal{A} > \alpha \supset \mathcal{A}(S) < \beta$

© Copyright 1996 to 2005 by Kenneth R. Thompson, Systems Predictive Technologies, 2096 Elmore Avenue, Columbus, Ohio 43224-5019;


All rights reserved. Intellectual materials contained herein may not be copied or summarized without written permission from the author.
156. \( \text{EQ}_{\text{A}} \uparrow \land \text{H} \uparrow S > \alpha \supseteq \mathcal{A}(S) < \beta \)

157. \( [\mathcal{L} | \mathcal{F} \mathcal{A}] \uparrow \supseteq F_p \downarrow \land f_0 \downarrow \)

158. \( T_p \uparrow \land \mathcal{Z}(S)^v \supseteq f_b \uparrow \)

159. \( [\Delta S > \alpha] \land [\mathcal{E}(S) > \beta] \land [\text{SB} \uparrow S > \gamma] \supseteq [S_p \uparrow \zeta] \lor [\mathcal{T}(S) > \eta] \lor [\text{SP} \uparrow S > \theta] \)

160. \( T_p \uparrow \land F_p \uparrow \land \mathcal{Z}(S)^c \supseteq f_0 \uparrow \)

161. \( O_p \uparrow \land \mathcal{F} \uparrow \land \mathcal{G} \uparrow n \supseteq f_0 \uparrow \)

162. \( T_p < \alpha \land f_t \uparrow \land \text{SB} \uparrow S < \beta \supseteq \text{SB} \uparrow S \uparrow \)

163. \( T_p > \alpha \land f_t \uparrow \land \text{SB} \uparrow S < \beta \supseteq \text{SB} \uparrow S \uparrow \)

164. \( I \uparrow S \supseteq \text{SB} \uparrow S < n \)

165. \( F \downarrow S \uparrow \supseteq D \uparrow S \uparrow \)

166. \( C \uparrow S \uparrow \supseteq S \uparrow \)

167. \( \mathcal{X}(S) \uparrow > n \supseteq \mathcal{Z}(S) \uparrow \)

168. \( I \uparrow S \land W \uparrow S \supseteq S \uparrow S > n \)

169. \( W \uparrow S > n \land C \uparrow S > m \supseteq D \uparrow S > p \)

170. \( [C \uparrow S | \mathcal{F} \mathcal{A}] \uparrow \supseteq [\mathcal{L} | \mathcal{F} \mathcal{A}] \uparrow \)

171. \( [D \uparrow S | \mathcal{F} \mathcal{A}] > \alpha \land [W \uparrow S | \mathcal{F} \mathcal{A}] < \beta \supseteq [D \uparrow S | \mathcal{F} \mathcal{A}] < \gamma \)

172. \( \mathcal{A} \supseteq W \uparrow S \uparrow \)

173. \( \mathcal{A} \uparrow \supseteq C \uparrow S \uparrow \)

174. \( \Delta \mathcal{Z}(S) > \Delta \text{HO} \uparrow S \)

175. \( \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq \mathcal{O}[\mathcal{Z}(S)] \uparrow \lor D \uparrow S \uparrow \)

176. \( S \uparrow S < n \supseteq \text{SG} \uparrow S < m \land \text{IG} \uparrow S < p \land \text{H} \uparrow S < r \)

177. \( W \uparrow S^\text{max} \land \mathcal{Z}(S) \uparrow \supseteq P \uparrow D \uparrow S \uparrow \lor \text{AD} \uparrow S \uparrow \)

178. \( \text{HO} \uparrow S^1_1 > n \land \mathcal{Z}(S)_1 > m \supseteq I \uparrow S_{12} \uparrow \)

179. \( \mathcal{Z}(S) \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq \mathcal{S} \uparrow \)

180. \( \mathcal{Z}(S) \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq F \uparrow S \uparrow \)

181. \( \mathcal{Z}(S) \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq C \uparrow S \uparrow \)

182. \( \mathcal{Z}(S) \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq D \uparrow S \uparrow \)

183. \( \mathcal{X}(S) \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq C \uparrow S \uparrow \)

184. \( \mathcal{X}(S) \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq C \uparrow S \uparrow \)

185. \( \mathcal{X}(S) \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq C \uparrow S \uparrow \)

186. \( \mathcal{X}(S) \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq C \uparrow S \uparrow \)

187. \( \mathcal{X}(S) \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq C \uparrow S \uparrow \)

188. \( [\text{AD} S^\text{max} | \mathcal{S} \mathcal{L} \mathcal{A}] \supseteq I \uparrow S \land F \uparrow S \land S \uparrow \land \mathcal{T}(S) \uparrow \land [\mathcal{L} | \mathcal{F} \mathcal{A}] \uparrow \)

189. \( \mathcal{A}(t_2) > \mathcal{A}(t_1) \supseteq T \uparrow S \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \land \mathcal{O}[\mathcal{Z}(S)] \uparrow \land \mathcal{O}[\mathcal{F} \mathcal{A}] \uparrow \)

190. \( \mathcal{O}[\mathcal{X}(S)] \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq T \uparrow \)

191. \( \mathcal{O}[\mathcal{X}(S)] \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq T \uparrow \)

192. \( \mathcal{O}[\mathcal{X}(S)] \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq T \uparrow \)

193. \( \mathcal{O}[\mathcal{X}(S)] \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq T \uparrow \)

194. \( \mathcal{O}[\mathcal{X}(S)] \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq T \uparrow \)

195. \( \mathcal{O}[\mathcal{X}(S)] \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq T \uparrow \)

196. \( \mathcal{O}[\mathcal{X}(S)] \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq T \uparrow \)

197. \( \mathcal{O}[\mathcal{X}(S)] \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq T \uparrow \)

198. \( \mathcal{O}[\mathcal{X}(S)] \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq T \uparrow \)

199. \( \mathcal{O}[\mathcal{X}(S)] \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq T \uparrow \)

200. \( \mathcal{O}[\mathcal{X}(S)] \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq T \uparrow \)

201. \( \mathcal{O}[\mathcal{X}(S)] \uparrow \land \mathcal{O}[\mathcal{X}(S)] \uparrow \supseteq T \uparrow \)
200. $Z(S)^\uparrow \land G[X(S)]^c \supseteq \mathcal{E}(S)^\downarrow$

201. $Z(S)^\uparrow \land G[X(S)]^c \supseteq$

$\phi(\mathcal{E}_F S)^\uparrow_{\text{max}} = n(t_1) \land$

$\phi(\mathcal{E}_F S)^\downarrow_{\text{min}} = m(t_2) \land m < n;$

where $\phi$ is a measure of $\mathcal{E}_F S$. 