



The slide features a whiteboard with the handwritten text "Always Be Closing" and a silhouette of a man in a suit pointing at it. The title "GLENGARRY GLEN ROSS" is displayed at the bottom in large, bold letters. On the right side, there are logos for TNO, R.H.T.J., and vrije Universiteit, along with the names of the researchers: Karel van den Bosch, Annerieke Heuvelink, Tijmen Muller, Ivo Swartjes, and Arjen Brandenburg.

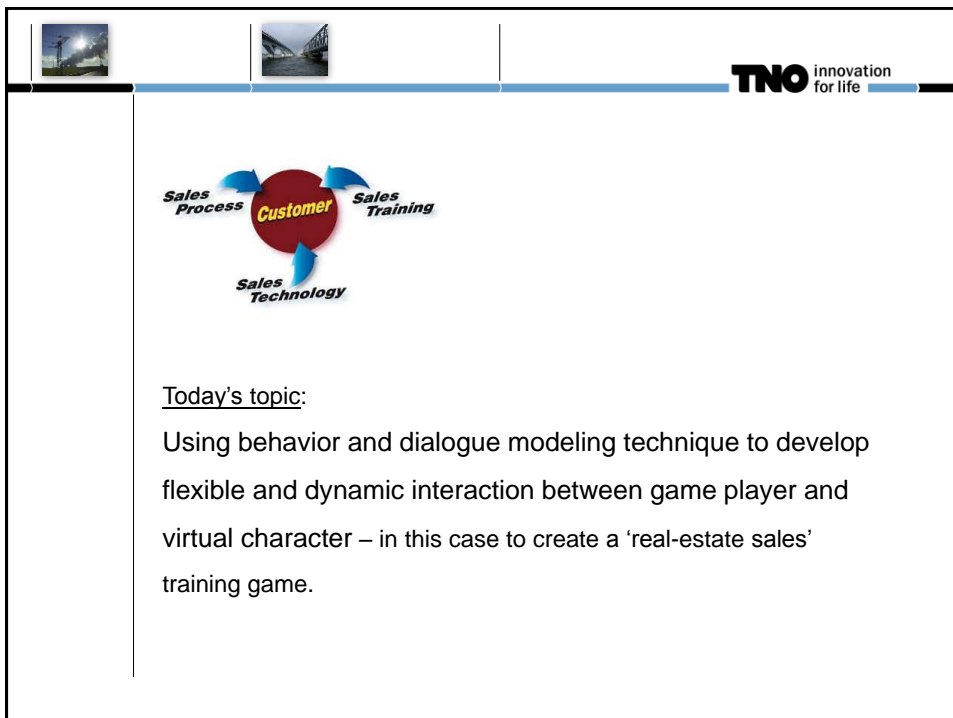
TNO innovation for life

TNO
Karel van den Bosch
Annerieke Heuvelink
Tijmen Muller

R.H.T.J.
Ivo Swartjes



vrije Universiteit
Arjen Brandenburg

GLENGARRY GLEN ROSS



The slide features a central diagram with a red circle labeled "Customer" in the center, surrounded by three blue arrows pointing towards it from "Sales Process", "Sales Training", and "Sales Technology". Below the diagram, the text "Today's topic:" is followed by a paragraph describing the use of behavior and dialogue modeling techniques to create a 'real-estate sales' training game.

TNO innovation for life



Today's topic:
Using behavior and dialogue modeling technique to develop flexible and dynamic interaction between game player and virtual character – in this case to create a 'real-estate sales' training game.




TNO innovation
for life

The promise of serious gaming



2



TNO innovation
for life

Game-training the dialogue, - for what?


- a. familiarizing the player-trainee with various types of conversational partners
(e.g. cooperative versus intractable; empathic versus reserved; extravert versus introvert)
- b. enabling practice in various conversational strategies
(e.g. fact-driven versus emotion-driven)
- c. make the player-trainee experience how different communication styles affect the partner and the course of the conversation
(e.g. asking rather than telling; providing facts instead of opinions)



Changing the dialogue, - but how?

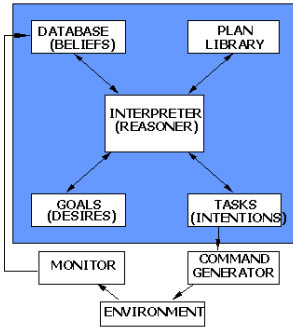




Scripting dialogue has conceptual and practical limitations



Changing the dialogue, - using BDI



Beliefs (what the agent knows of its world)
Desires (what the agent wants to accomplish)
Intentions (how the agent tries to achieve its goals)





Equipping a virtual character (NPC) with:


- a. its own individual knowledge base
(e.g. facts about the house, preferences, market prices, etc)
- b. goals
(e.g. asking for information, telling information, express preference, etc)
- c. individual characteristics and strategies
(e.g. talkative versus distant; leading versus following; easy or difficult to persuade, etc).



Claims

BDI-based NPCs make the game and dialogue:

- More flexible and interactive (*mixed initiative*)
- Expandable and more easy to reuse
- More realistic and more believable



7

TNO innovation for life

Ontology

Flexibility and reusability through:
Specifying properties of *buyer* and *house* in ontology (Protegé)



TNO innovation for life

Ontology to define personality of an NPC

BuyerAgentDescription

Role: Concrete



Name
buyerFacts
buyerConversationTopicImportances
buyerPredicateImportances
extraversion
agreeableness
thresholdComfortLevel
initialComfortLevel
initialWillingnessToDiscussHouse
initialWillingnessToBuy
thresholdWillingnessToDiscussHouse
thresholdWillingnessToBuy
buyerChitChats
buyerArgumentationAppreciations
buyerOpinionInterpretationDeductions



Modeling “Extraversion” in NPCs

- extravert NPCs tell information; introvert NPCs ask questions
- extravert NPCs express wishes & opinions; introvert NPCs tell facts
- extravert NPCs acknowledge information received; introvert NPCs do not
- extravert NPCs answer in detail; introvert NPCs answer concisely
- extravert NPCs select positive opinion corresponding to facts; introvert NPCs select negative opinion

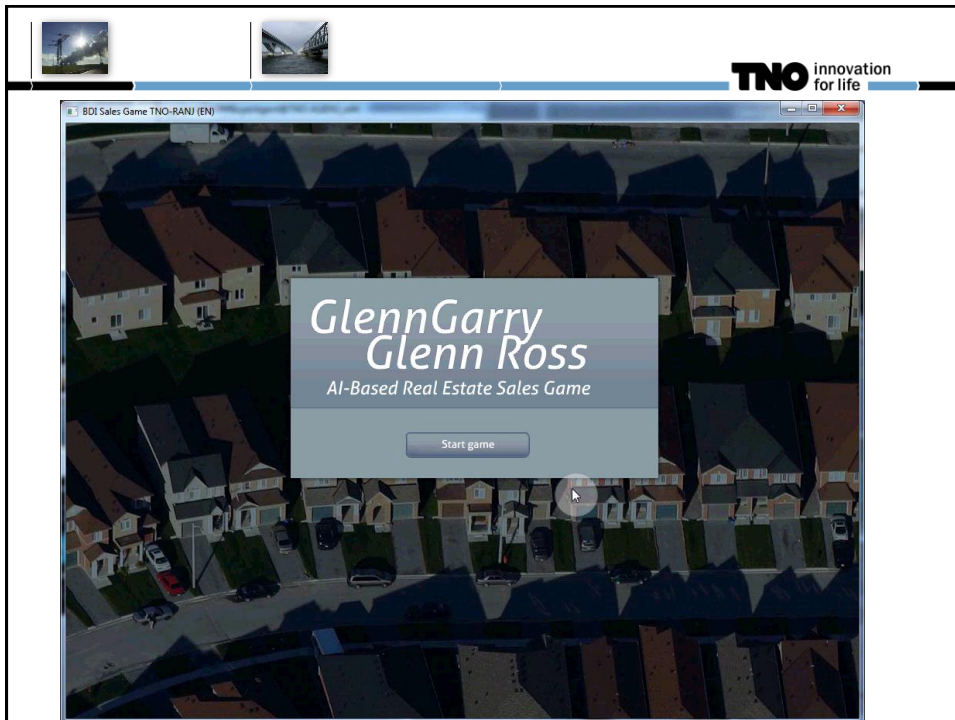
10



Modeling “Agreeableness” in NPCs

- agreeable NPCs tell about the house; disagreeable NPCs about themselves
- agreeable NPCs are more likely to comply with the proposed conversation topic
- agreeable NPCs are more likely to adopt the opinion suggested by the player
- agreeable NPCs are more polite (e.g. acknowledging information)

11




innovation
for life

Validation

Do players recognize assigned personality profile of NPC when interacting with such characters?

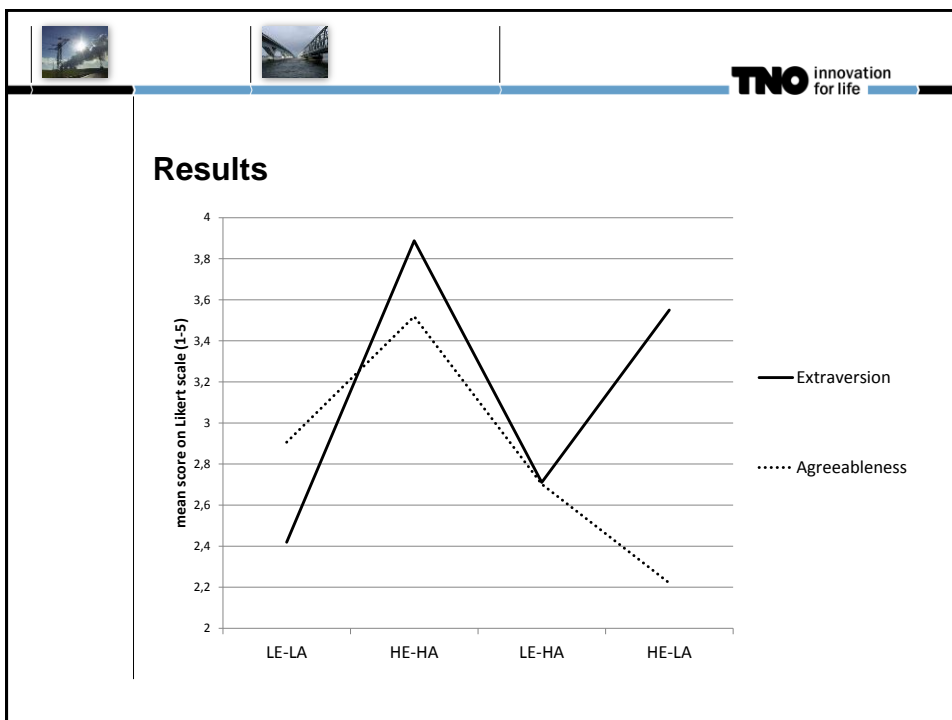
- › 32 subjects played the game 4 times: each time the NPC has different personality; game-order was randomized
- › After each game session: HEXACO questionnaire addressing the behavior of NPC as experienced by player (using Likert-scales)


Experiment-design			
		Extraversion	
		0.9	0.1
Agreeableness	0.9	HE-HA	LE-HA
	0.1	HE-LA	LE-LA



TNO innovation for life

The player's impression of the NPC should be based upon its behavior, not on its appearance. Therefore the experimental game's interface just showed the NPC's silhouette





Results


	High-extravert buyer	Low-extravert buyer
Extraversion-rating*	3.72	2.56

* $t(29)=8.22; p<0.1$

	High-agreeable buyer	Low-agreeable buyer
agreeableness-rating*	3.11	2.56

* $t(29)=2.63, p<.05$

Conclusion: players rated NPC in accordance with their assigned personality traits



Discussion

- Serious games potentially offer good platform for training communication skills
- The quality of the NPC determine value of training game
- Combining this BDI and ontology approach enables the design of rich and realistic NPCs
- The mixed-initiative dialogue, made possible by powerful NPCs, gives games the potential for good training