GMIN 317 – Moteur de Jeux

Intelligence artificielle pour le jeu vidéo

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Cette présentation va s'intéresser aux différentes techniques d'intelligence artificielle utilisées dans les moteurs de jeu.

Surtout sur le plan des méthodes génériques d'utilisation courante.

Ce cours est largement inspiré des cours de Marc Moulis et Benoit Lange.

Personnages non-joueurs (non-player characters)

- Comportements d'un personnage non joueur
  - Attaque, fuite, poursuite, patrouille
  - Recherche de chemins
  - Imitation/adaptation
  - Expression de sentiments
  - Apprentissage
  - Interaction avec les autres personnages
- Tous contrôlés par intelligence artificielle
- A chaque boucle du jeu (très vite)

Plan du cours

Recherche de chemins

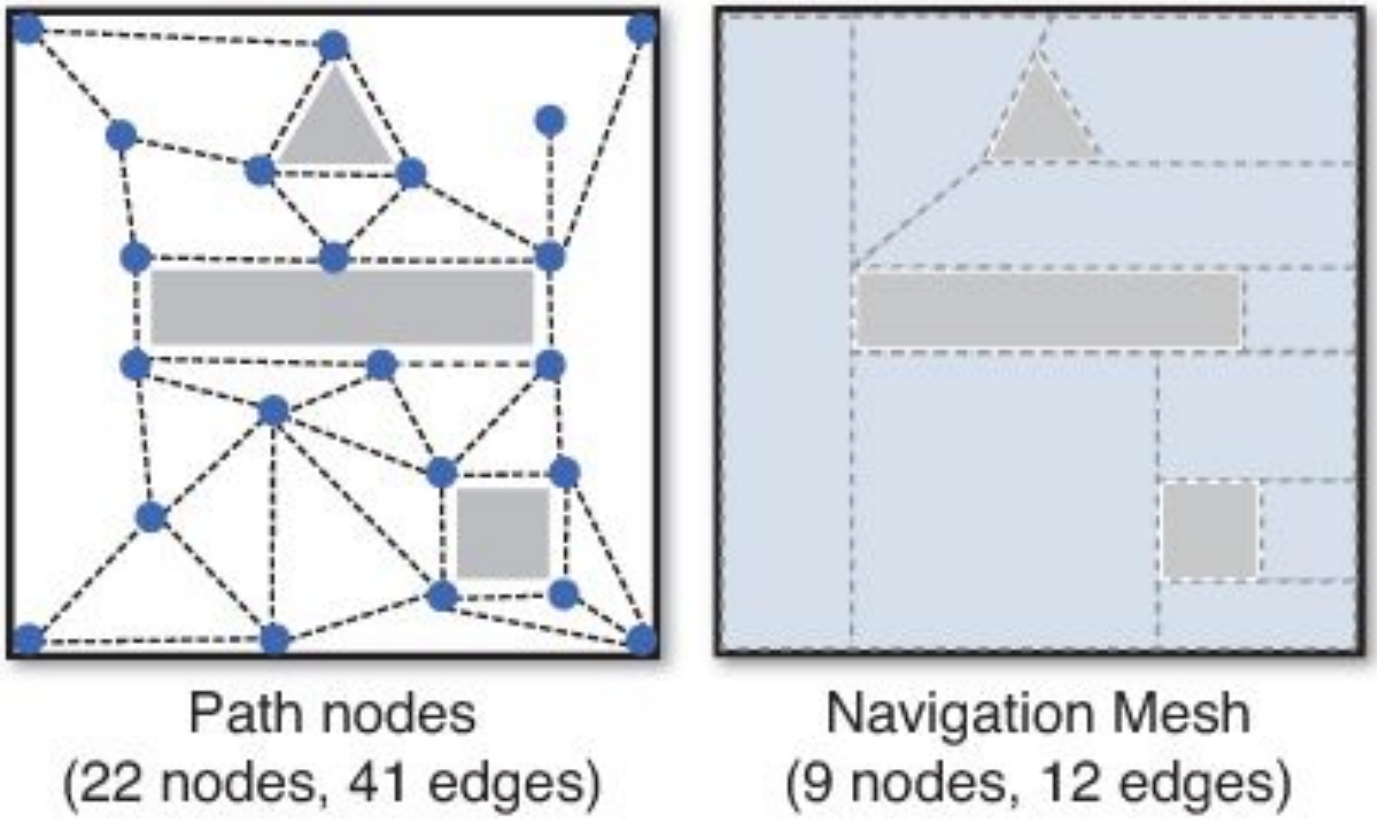
Machines d'états finis

Arbres de comportements

Caméras intelligentes

Intelligence artificielle des SIMS

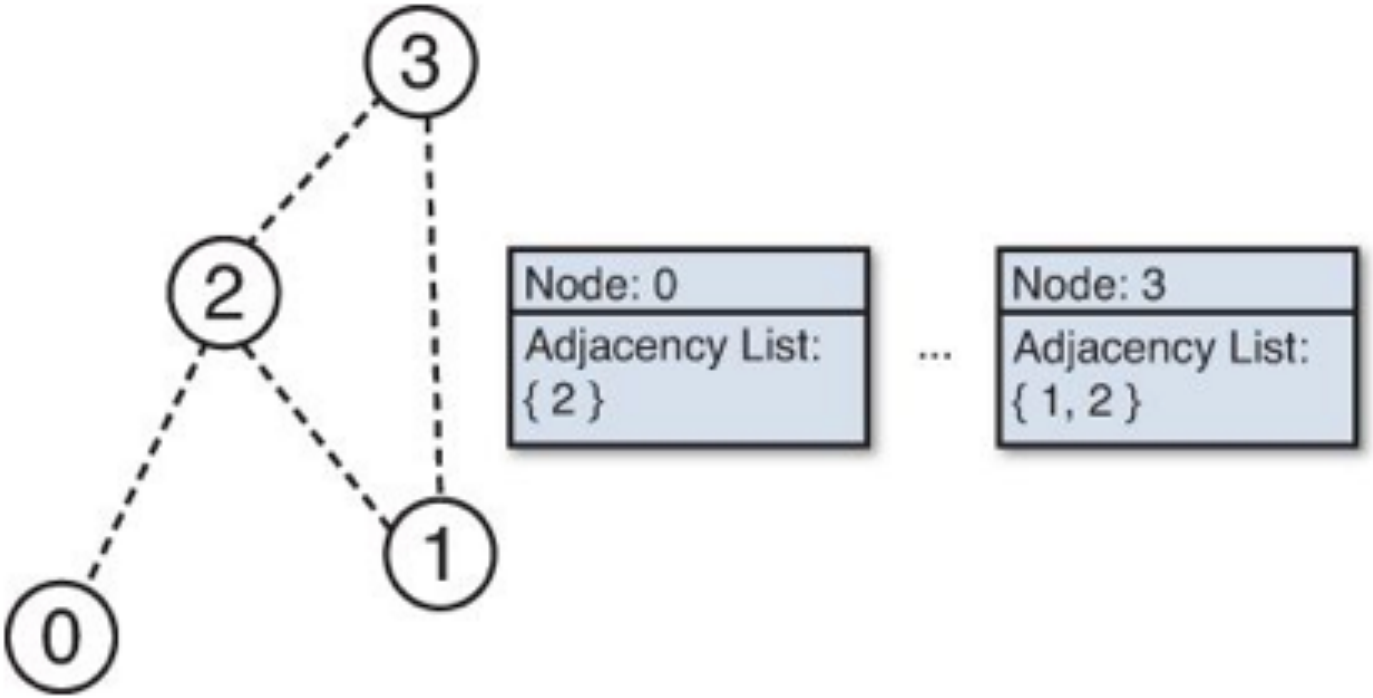
Path nodes et navigation meshes



Path nodes
(22 nodes, 41 edges)

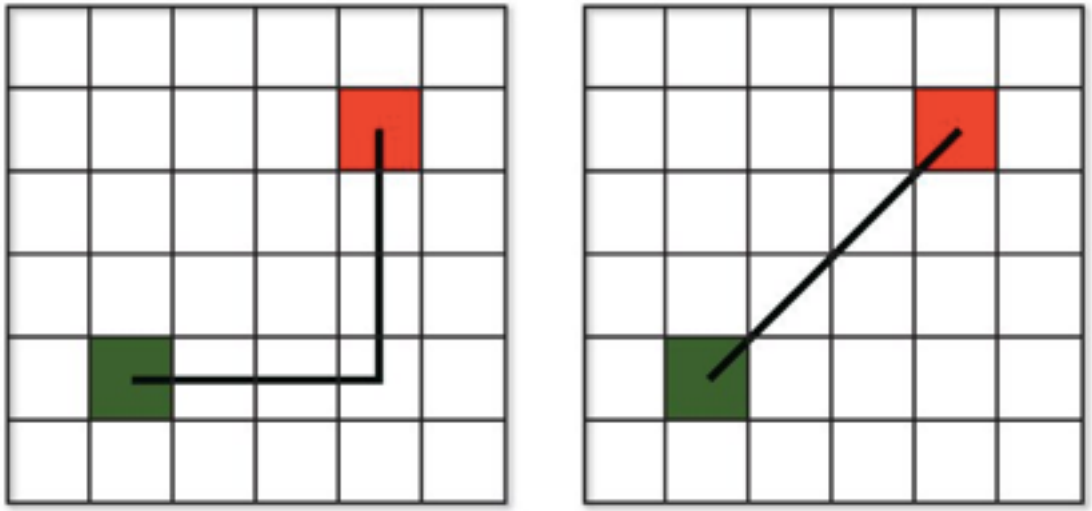
Navigation Mesh
(9 nodes, 12 edges)

Graphe de parcours



Recherche de plus courts chemins

- La longueur d'un chemin est supérieure à la distance de Manhattan, qui est supérieure à la distance Euclidienne



Manhattan Distance
h(x) = 6

Euclidean Distance
h(x) = 4.24

Arbre de parcours du graphe

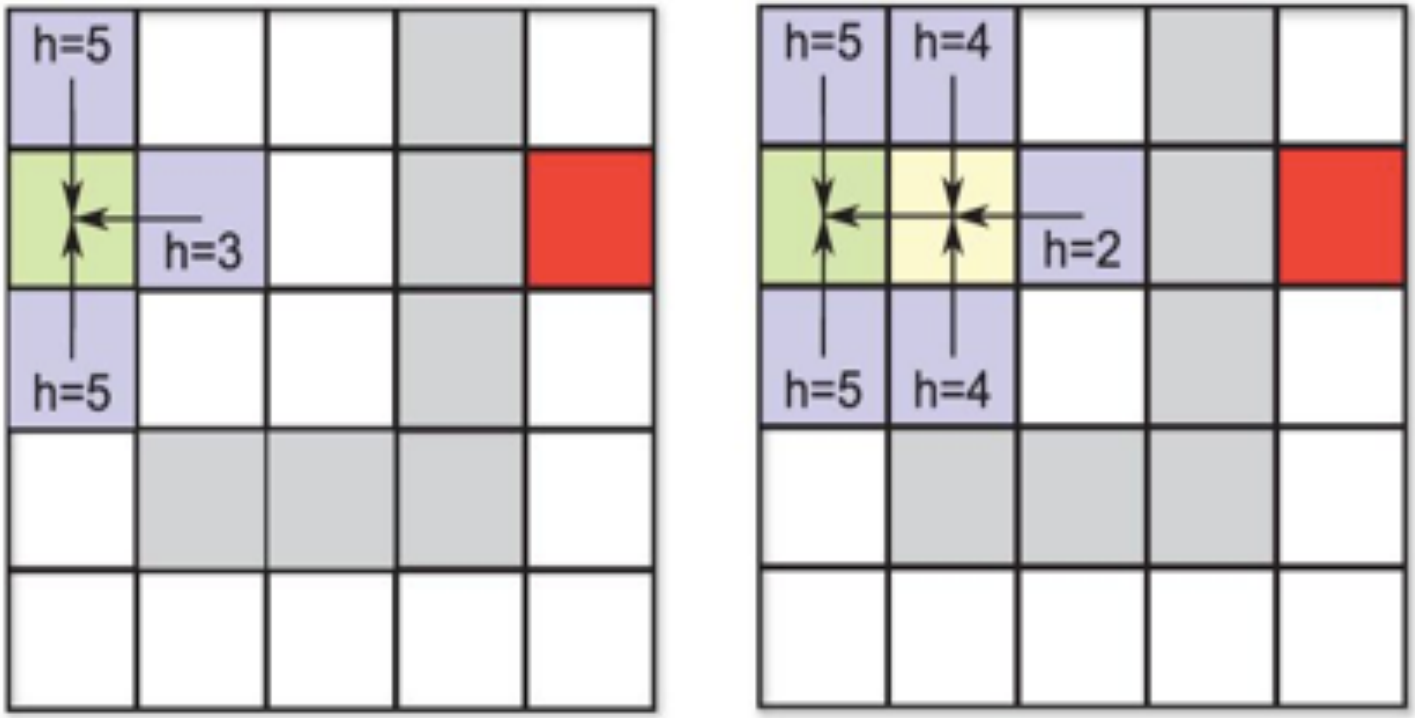
```
struct Node
    Node parent
    float h
end
```

- OpenSet : Noeuds à évaluer, par ordre de distance croissante (file de priorité)
- ClosedSet : Noeuds déjà évalués (arbre binaire)

Parcours « best-first »

```
do
   foreach Node n adjacent to currentNode
      if closedSet contains n
         continue
      else
         n.parent = currentNode
         if openSet does not contain n
            compute n.h
            add n to openSet
         end
      end
   loop //end foreach
```

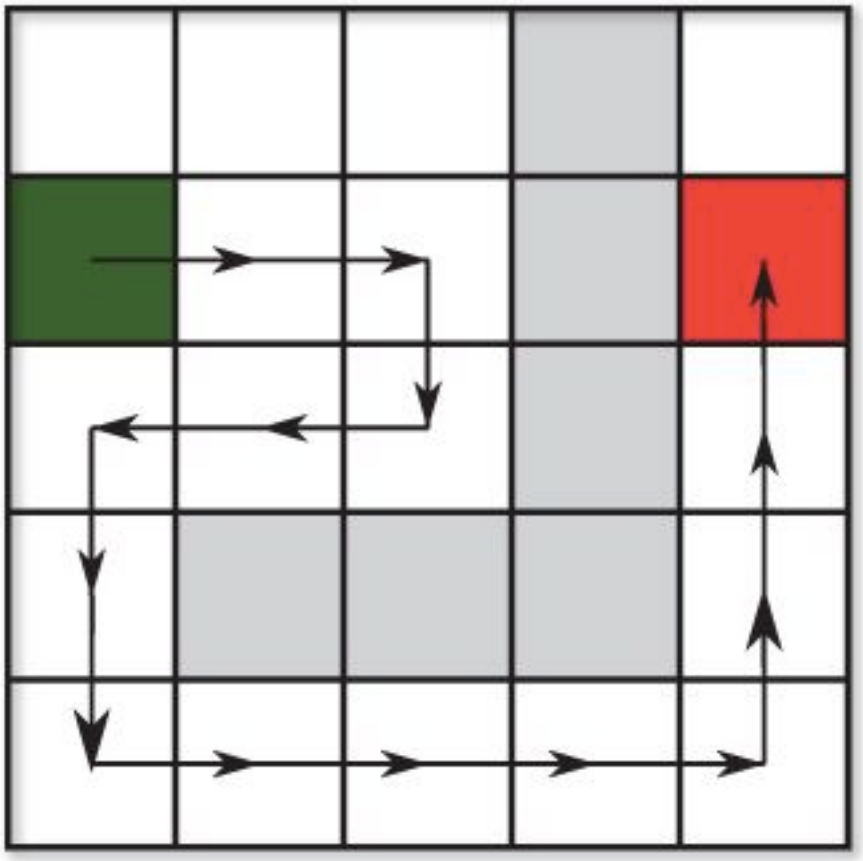
Parcours best-first



(a): First Iteration

(b): First Iteration

Recherche heuristique



Algorithme A*

- Meilleure estimation de la distance totale

$$f(x) = g(x) + h(x)$$

- Révision du meilleur chemin

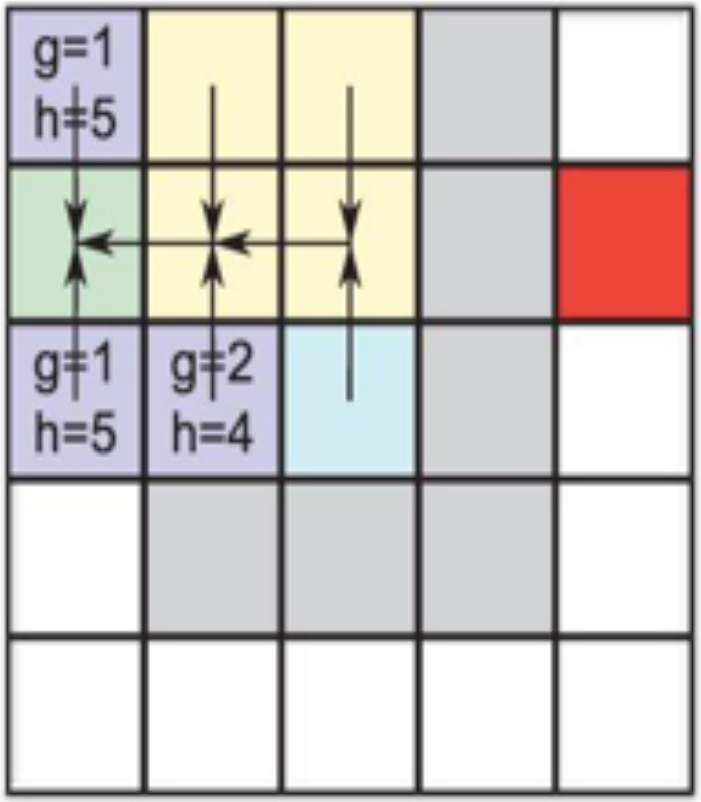
```
struct Node
    Node parent
    float f
    float g
    float h
end
```

Algorithme A*

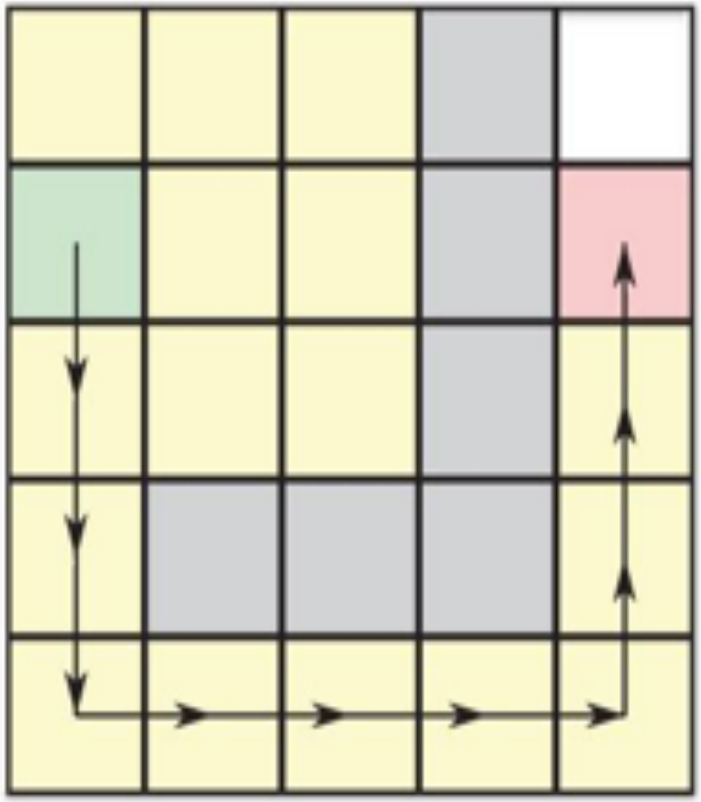
```
currentNode = startNode
add currentNode to closedSet
do
   foreach Node n adjacent to currentNode
      if closedSet contains n
         continue
      else if openSet contains n // Check for adoption
         compute new_g // g(x) value for n with currentNode as parent
         if new_g < n.g
            n.parent = currentNode
            n.g = new_g
            n.f = n.g + n.h // n.h for this node will not change
         end
      else
         n.parent = currentNode
         compute n.h
         compute n.g
         n.f = n.g + n.h
         add n to openSet
      end
   loop

   if openSet is empty
      break
   end
   currentNode = Node with lowest f in openSet
   remove currentNode from openSet
   add currentNode to closedSet
until currentNode == endNode
// Path reconstruction from Listing 9.1.
...
```

Exemple



(a): Current Node Adoption Fails



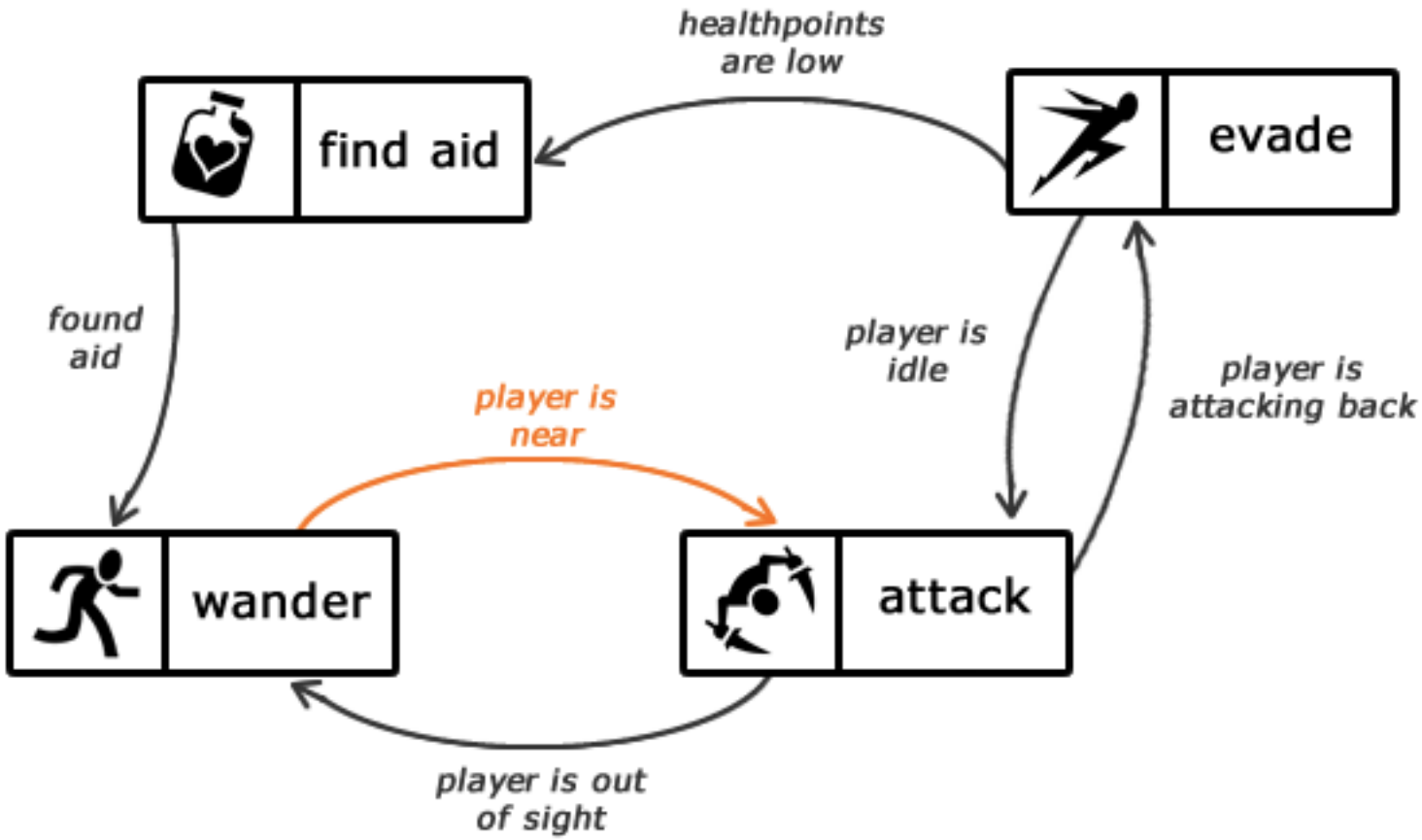
(b): Final A* Route

Algorithme de Dijkstra

$$f(x) = g(x) + h(x)$$
$$h(x) = 0$$
$$\therefore f(x) = g(x)$$

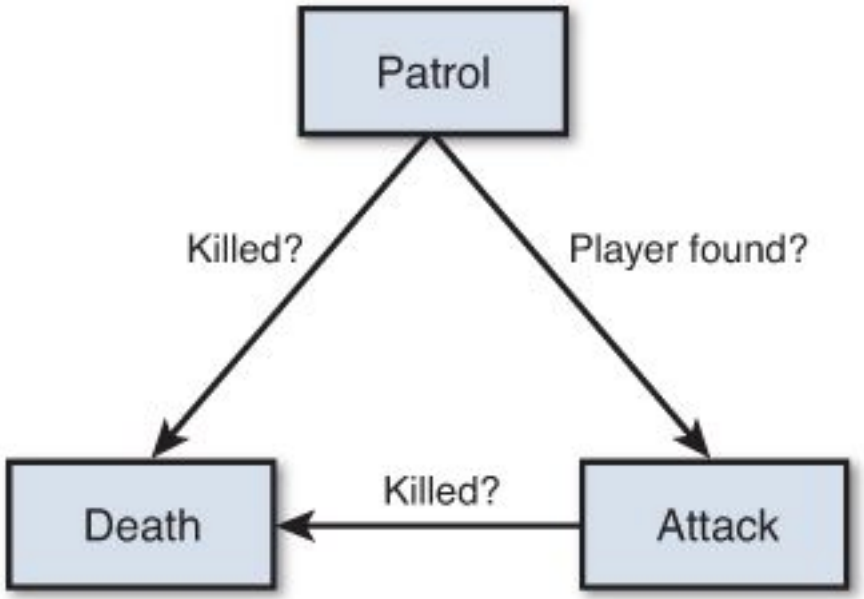
- Avantage : trouve toutes les solutions
- Inconvénient : parcourt tous les chemins possibles

Machines d'états finis



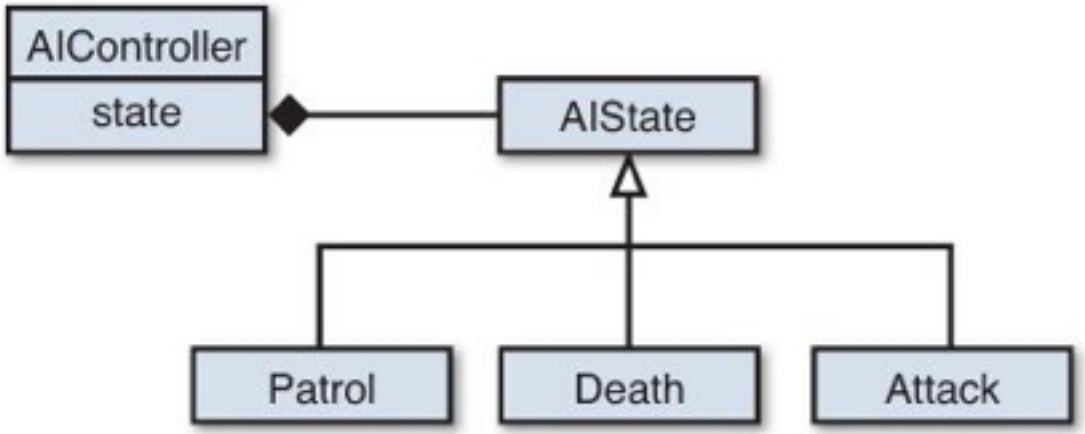
Exemple de machine d'états finis

```
function AIController.Update(float deltaTime)
    if state == Patrol
        // Perform Patrol actions
    else if state == Death
        // Perform Death actions
    else if state == Attack
        // Perform Attack actions
    end
end
```



Exemple d'implémentation

```
class AIState
    AIController parent
    function Update(float deltaTime)
     function Enter()
     function Exit()
end
```



Exemple d'implémentation

```
class AIController
    AIState state
    function Update(float deltaTime)
    function SetState(AIState newState)
end
```

```
function AIController.SetState(AIState newState)
    state.Exit()
    state = newState
    state.Enter()
end
```

Goal-oriented action planning (GOAP)

- Goal-Oriented Action Planning (aka GOAP, rhymes with soap) refers to a simplfied STRIPS-like planning architecture specifically designed for real-time control of autonomous character behavior in games.
- JEFF ORKIN originally implemented GOAP for F.E.A.R. while working at Monolith Productions.
- GOAP was inspired by the Synthetic Characters Group's C4 agent architecture at the MIT Media Lab, and Nils Nilsson's description of STRIPS planning in his AI book.

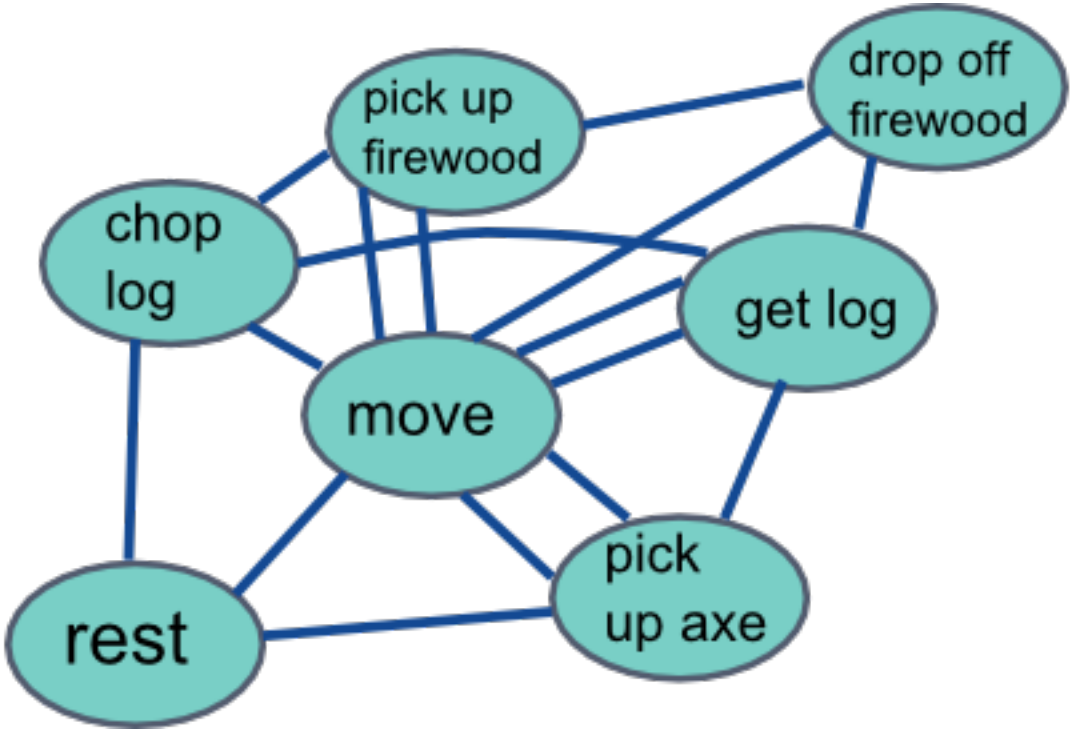
Goal-oriented action planning (GOAP)

- Goal oriented action planning is an artificial intelligence system for agents that allows them to plan a sequence of actions to satisfy a particular goal.
- The particular sequence of actions depends not only on the goal but also on the current state of the world and the agent.
- This means that if the same goal is supplied for different agents or world states, you can get a completely different sequence of actions, which makes the AI more dynamic and realistic.

GAMES USING GOAP ARCHITECTURES

- F.E.A.R. (X360/PS3/PC) - Monolith Productions/VU Games, 2005
- Condemned: Criminal Origins (X360/PC) - Monolith Productions/Sega, 2005
- S.T.A.L.K.E.R.: Shadow of Chernobyl (PC) - GSC Game World/THQ, 2007
- Mushroom Men: The Spore Wars (Wii) - Red Fly Studio, 2008
- Ghostbusters (Wii) - Red Fly Studio, 2008
- Silent Hill: Homecoming (X360/PS3) - Double Helix Games/Konami, 2008
- Fallout 3 (X360/PS3/PC) - Bethesda Softworks, 2008
- Empire: Total War (PC) - Creative Assembly/SEGA, 2009
- F.E.A.R. 2: Project Origin (X360/PS3/PC) - Monolith Productions/Warner Bros, 2009
- Demigod (PC) - Gas Powered Games/Stardock, 2009
- LMNO (working title) (X360/PS3) - Electronic Arts
- Just Cause 2 (PC/X360/PS3) - Avalanche Studios/Eidos Interactive, 2010
- Transformers: War for Cybertron (PC/X360/PS3) - High Moon Studios/Activision, 2010
- Trapped Dead (PC) - Headup Games, 2011
- Deus Ex: Human Revolution (PC/X360/PS3) - Eidos Interactive, 2011

Goal-oriented action planning (GOAP)



Goal-oriented action planning (GOAP)

GOAL: "make firewood"
Current State: "doesn't have an axe", "an axe is available"
Can action ChopLog run?
  NO - requires precondition "has an axe"
  Cannot use it now, try another action.
Can action GetAxe run?
  YES, preconditions "an axe is available" and "doesn't have an axe" are true.
  PUSH action onto queue, update state with action's effect
New State
  "has an axe"
  Remove state "an axe is available" because we just took one.
Can action ChopLog run?
  YES, precondition "has an axe" is true
  PUSH action onto queue, update state with action's effect
New State
  "has an axe", "makes firewood"
We have reached our GOAL of "makes firewood"
Action sequence: GetAxe -> ChopLog

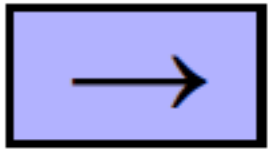
Arbres de comportements

- Arbres de comportements (Behavior Trees)
  - Utilisés dans Halo, Spore, etc.
  - Décomposition hiérarchique des comportements (ET/OU)
  - Décomposition séquentielle des comportements
  - Branches de l'arbre sont des conditions à tester et des actions à exécuter

Arbres de comportements

Interior Nodes

- **Sequence node** *(similar to AND)*



- **Selector node** *(similar to OR)*

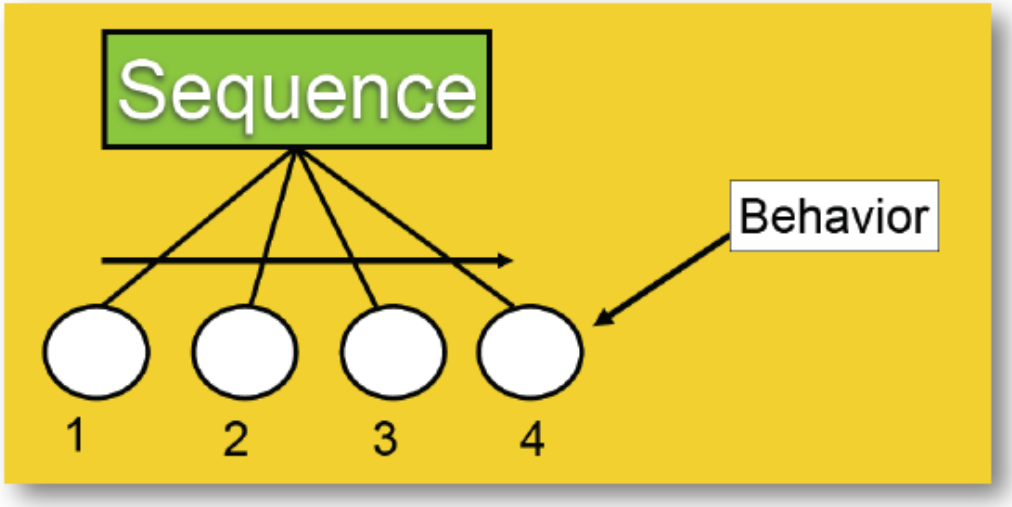
Leaf Nodes:

- Can be either *Conditions* or *Actions*
- are game-dependent
- Actions typically change the NPC or game state
- Conditions return true or false based on some check

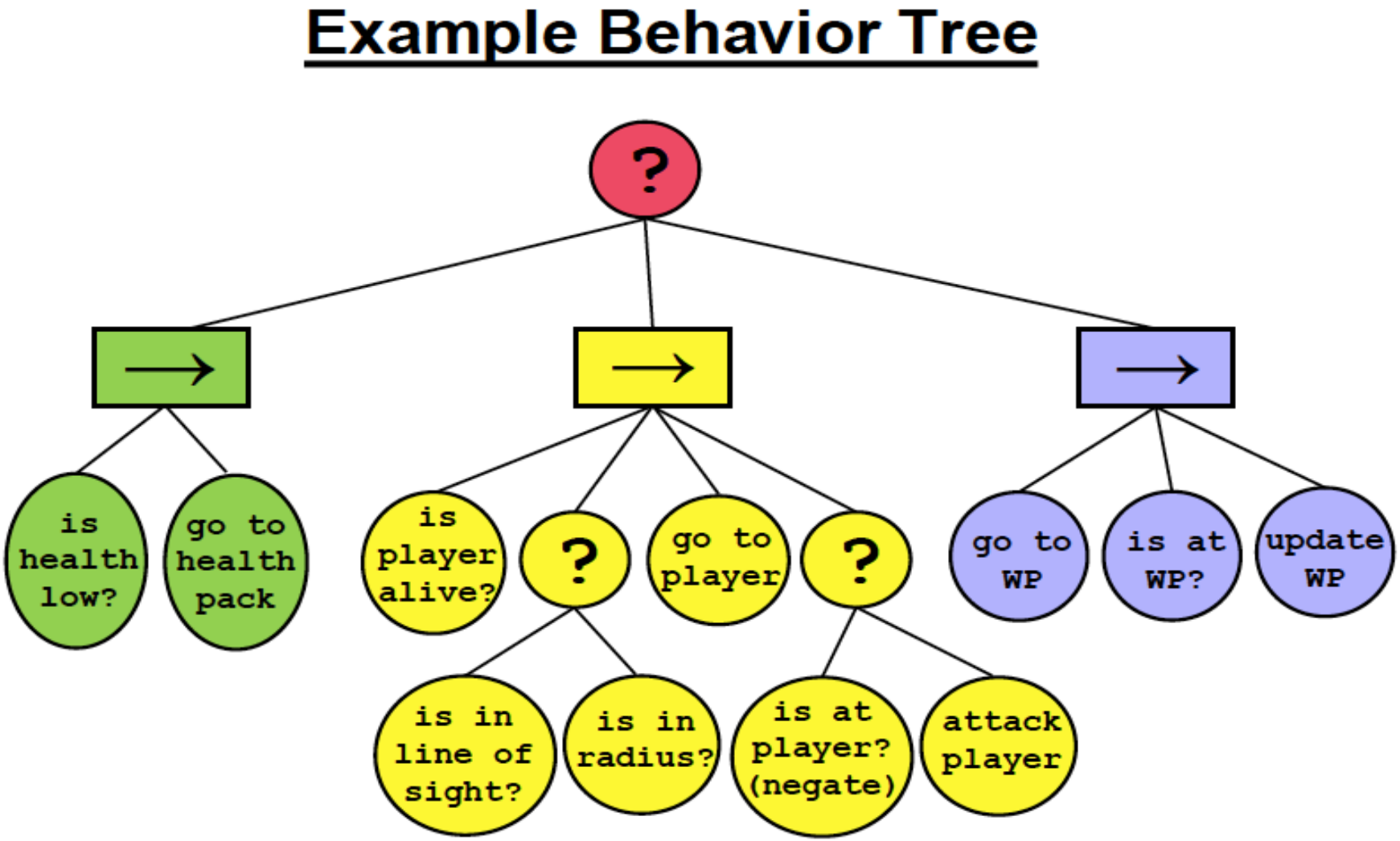
Arbres de comportements

Behavior Tree - Sequence

- Basic functionality:
- Child behavior succeeds ➔ sequence continues
- Child behavior fails ➔ sequence fails



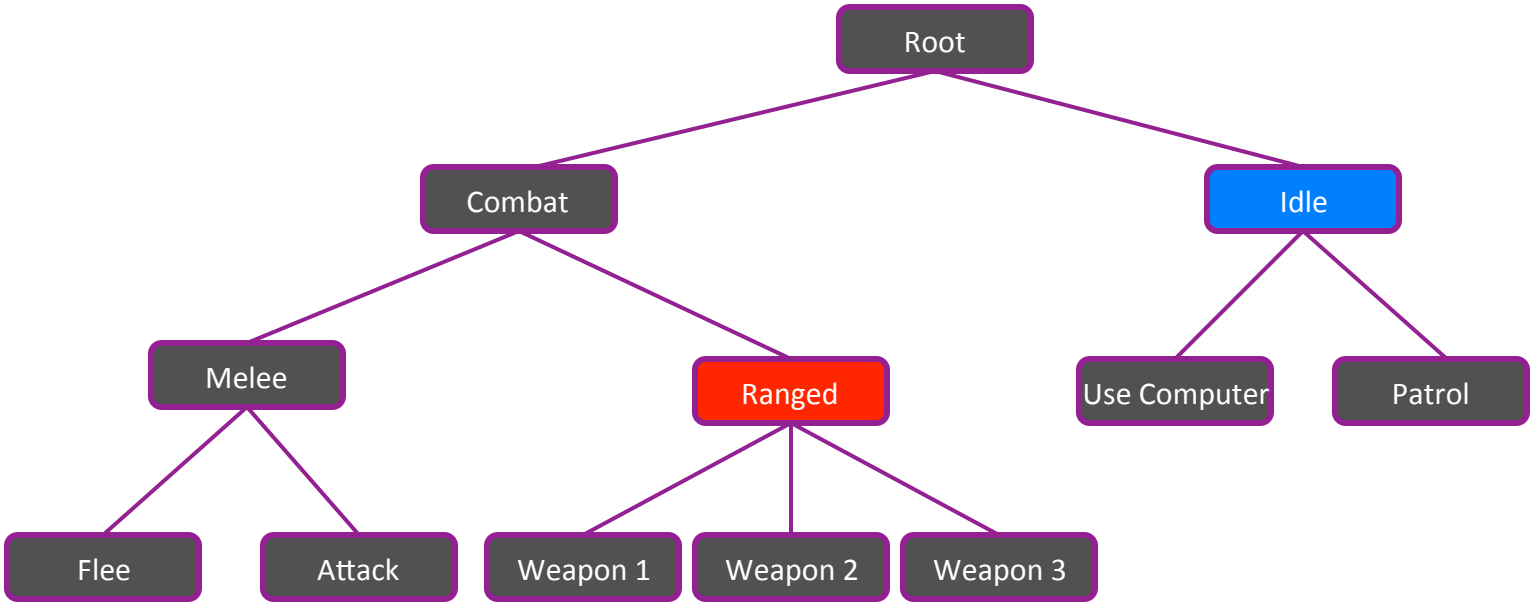
Arbres de comportements



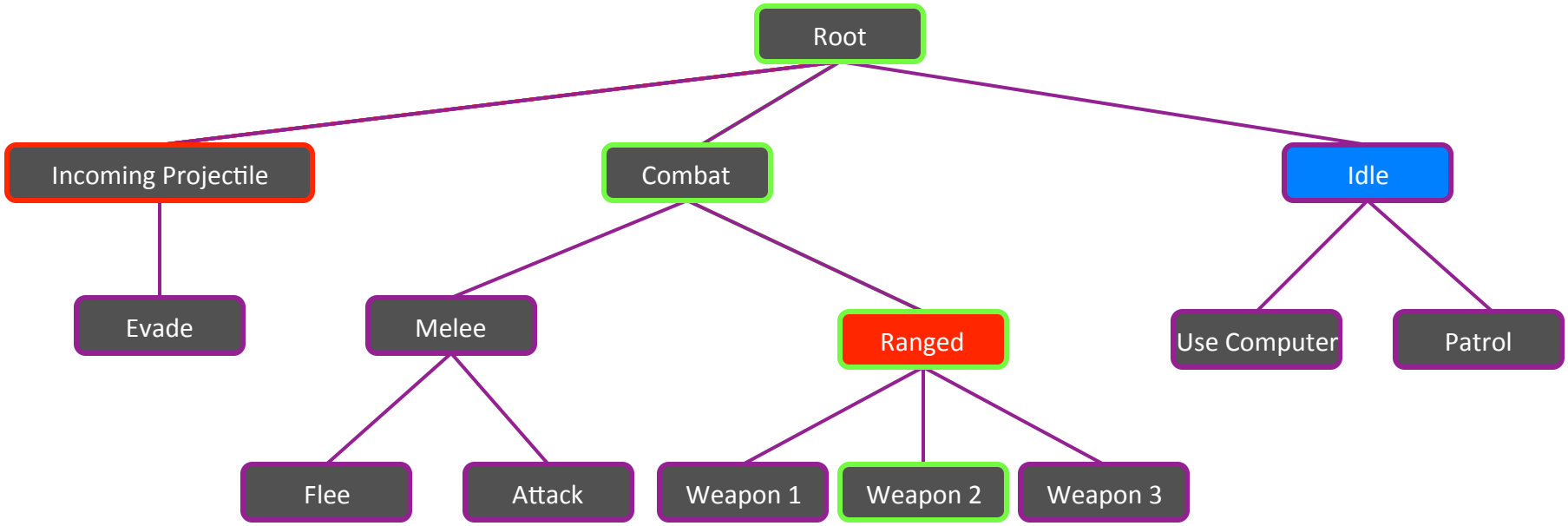
Node Types

- Priority
  - Child nodes are evaluated in order until one validates
- Sequential
  - First child is validated and executed
  - When it is finished, the next one is validated
- Stochastic
  - All children are validated
  - A random node is selected among the valid ones

Behavior Tree Update



Event-Driven Behaviors

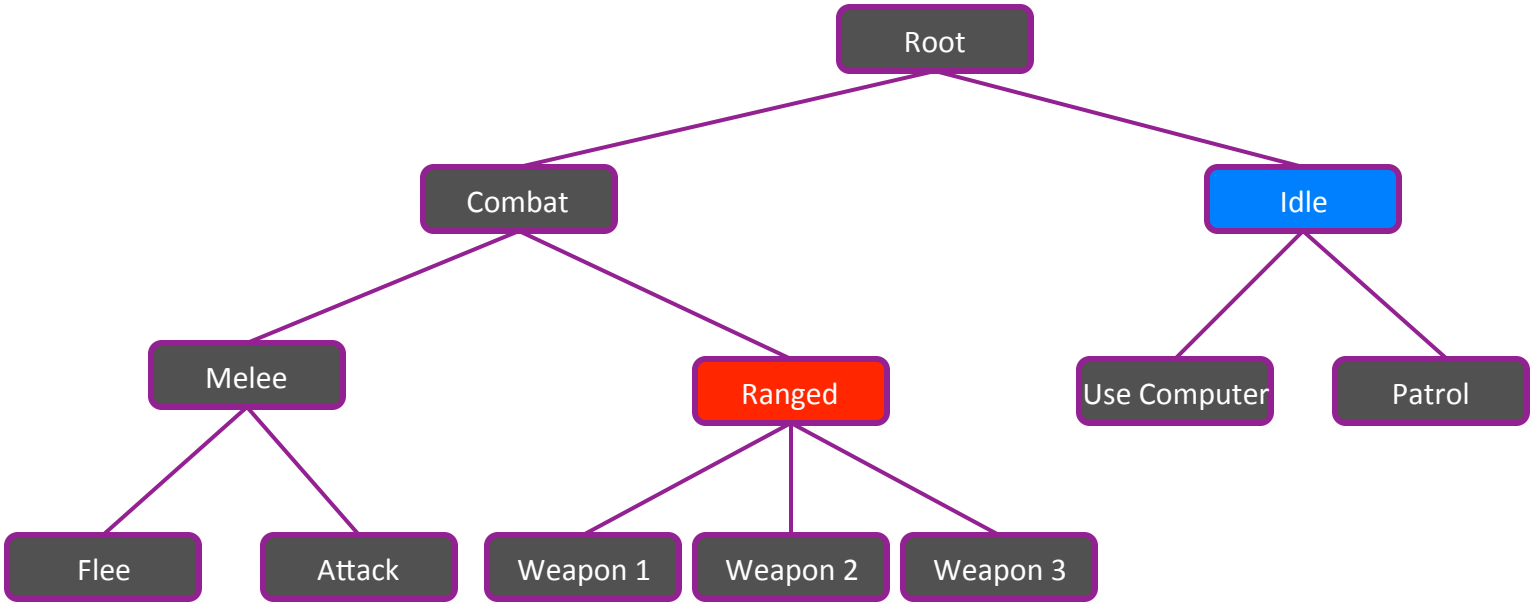


- Stimulus types
  - Disabled by event
  - Autodisabled

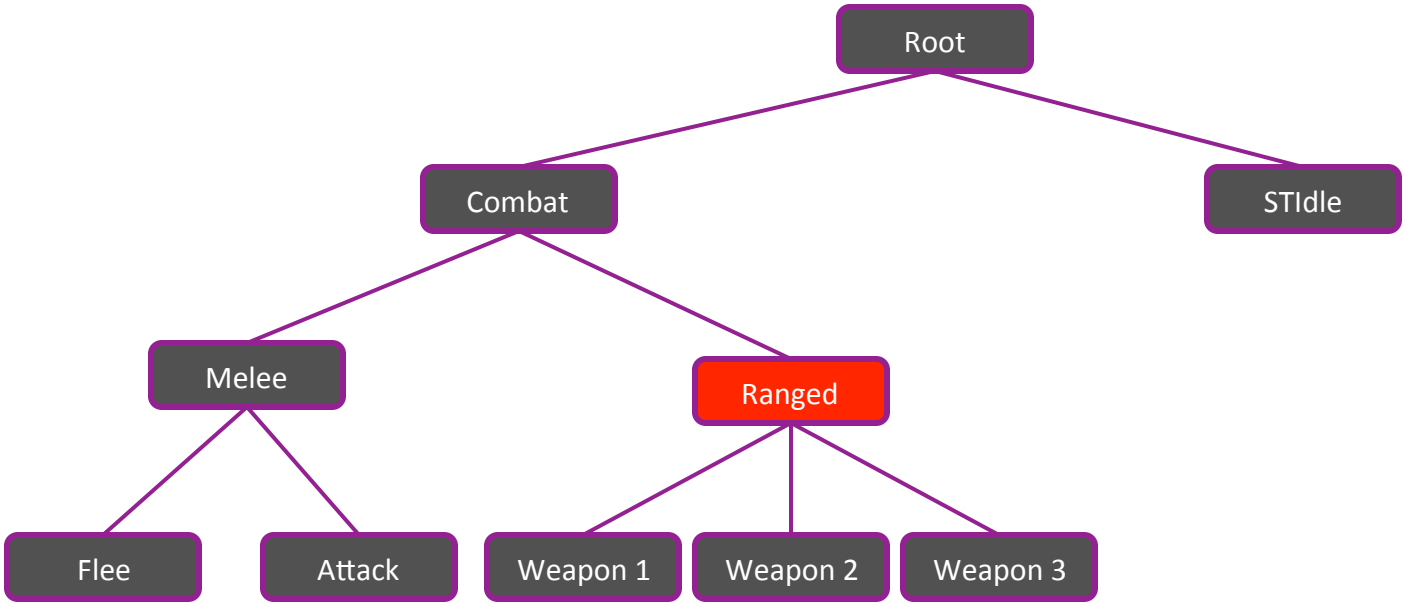
Dynamic Behaviors

- Dynamic behaviors support
  - Level specific content
    - Patrols
    - Initial setups
    - Story driven events
  - DLC
- Behaviors are added to actors in the level (enticers)
  - When a NPC uses the actor, it attaches the behavior to the tree

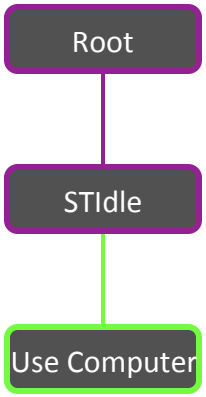
Dynamic Behaviors



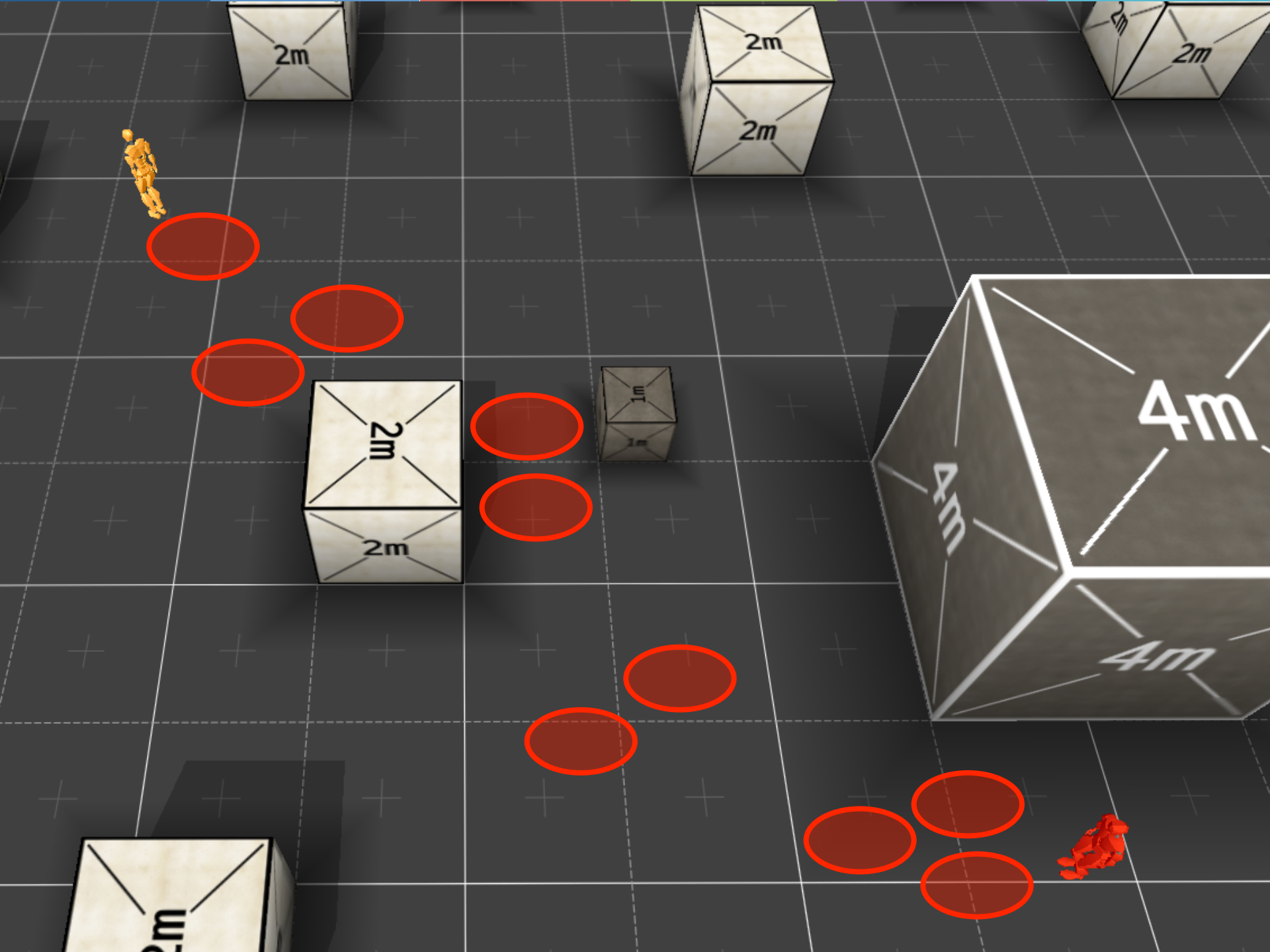
Dynamic Behaviors



Dynamic Behaviors



- Validate
  - Look for enticers
- Update
  1. Move to enticer
  2. Wait for other NPCs
  3. Subscribe
     - Attach new behavior to the tree
  4. Wait for behavior to finish
  5. Unsubscribe
     - Remove behavior from the tree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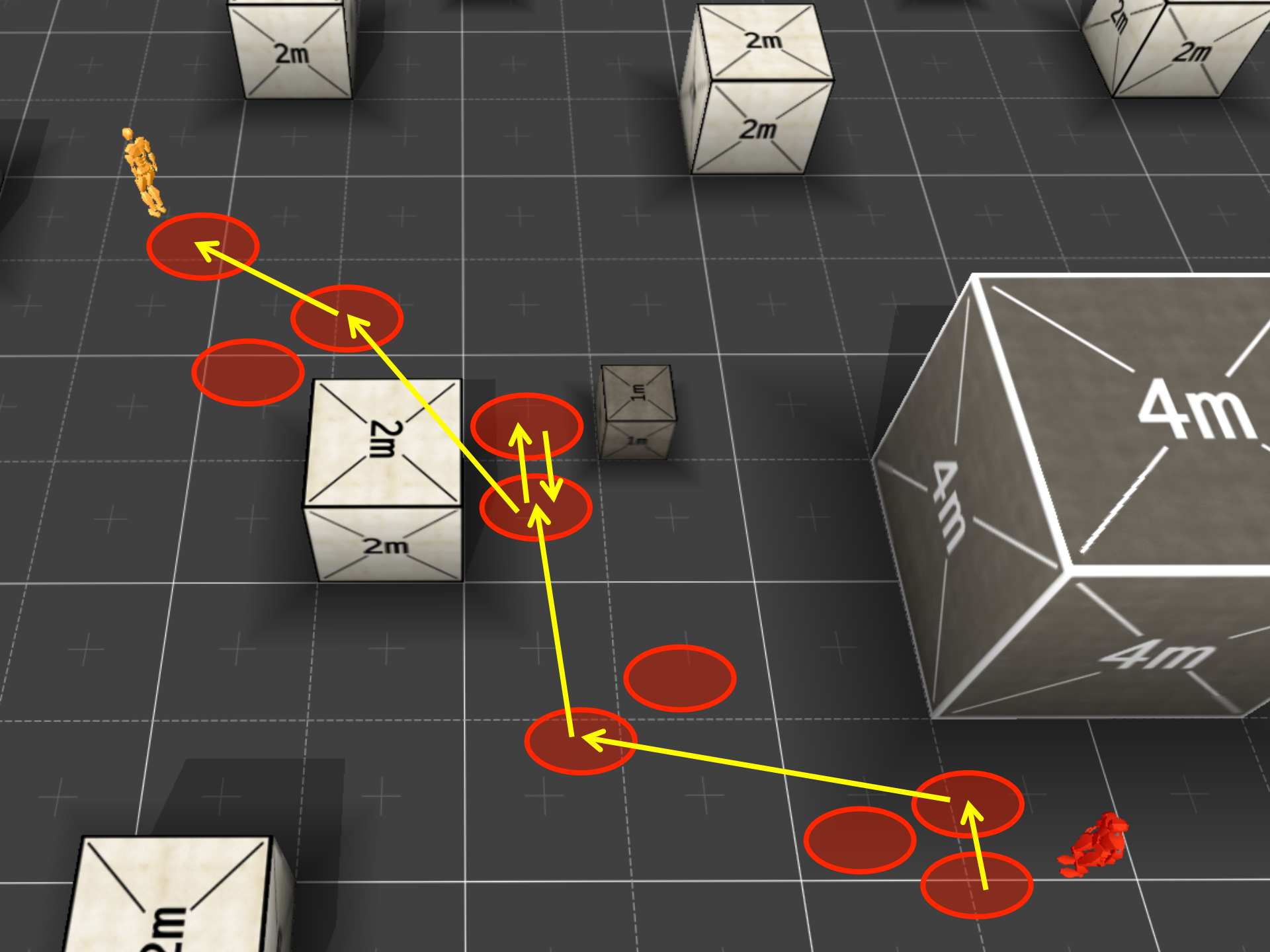
4m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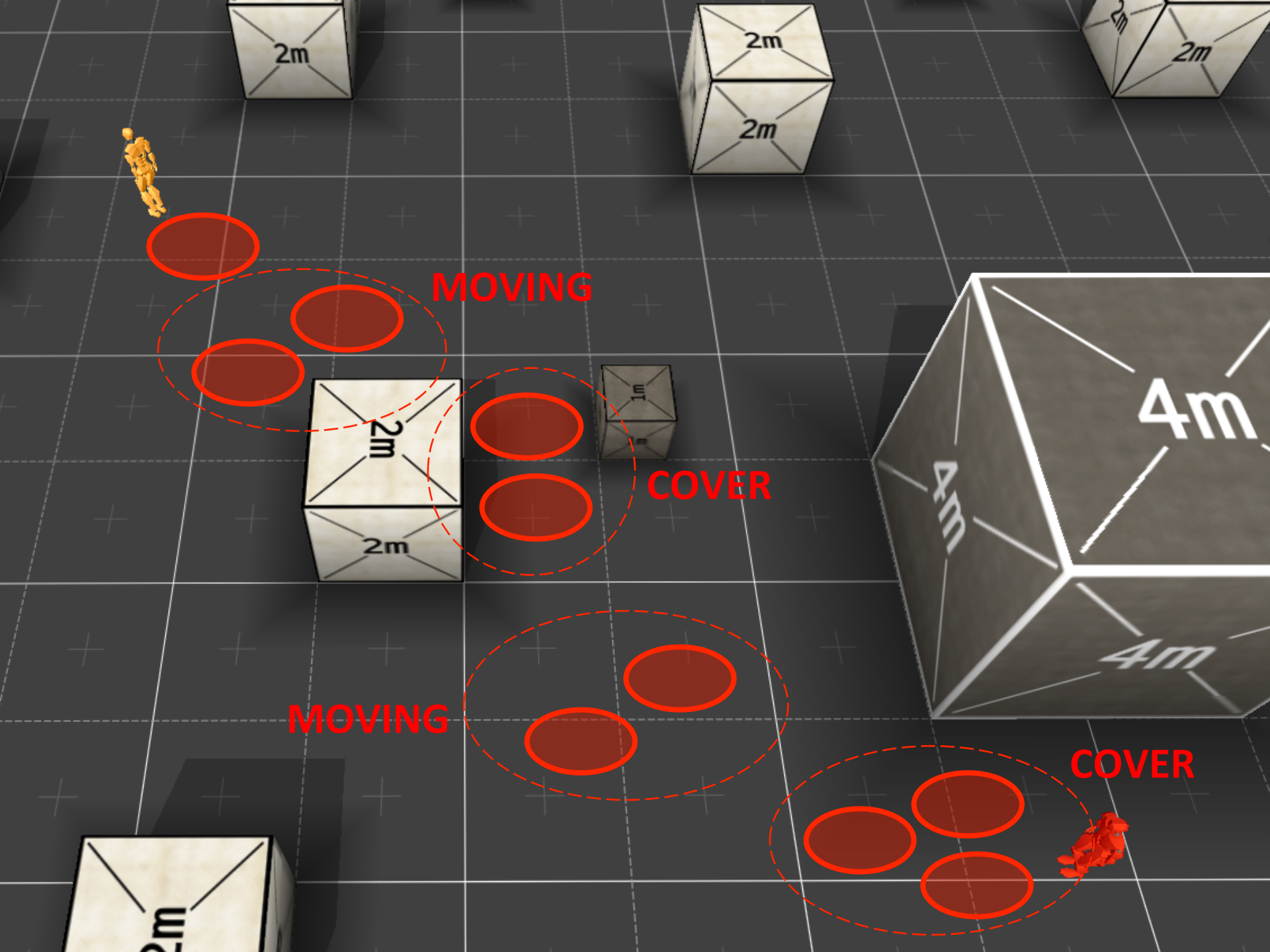
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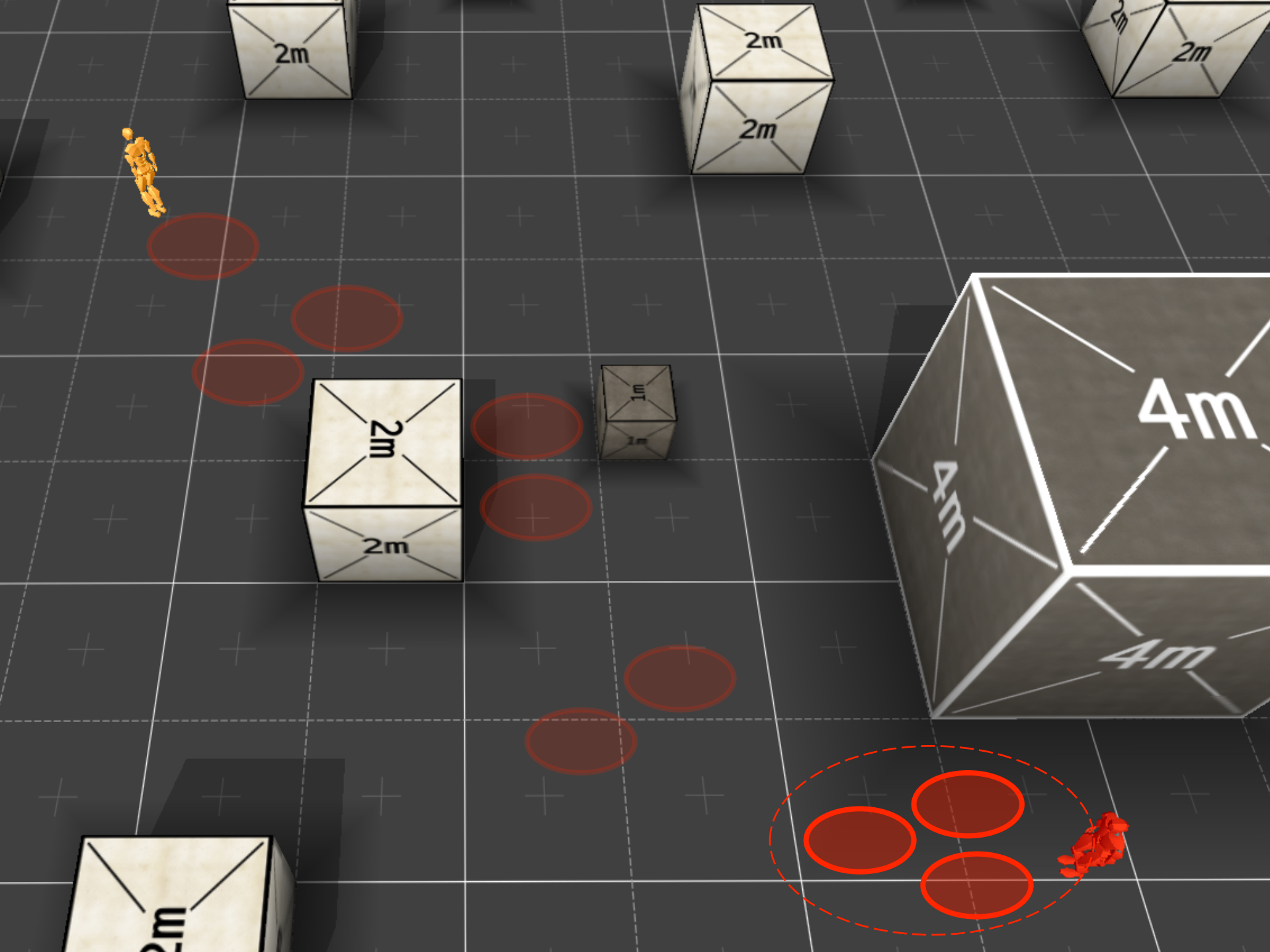
4m
4m
4m
MOVING
COVER
MOVING
COVER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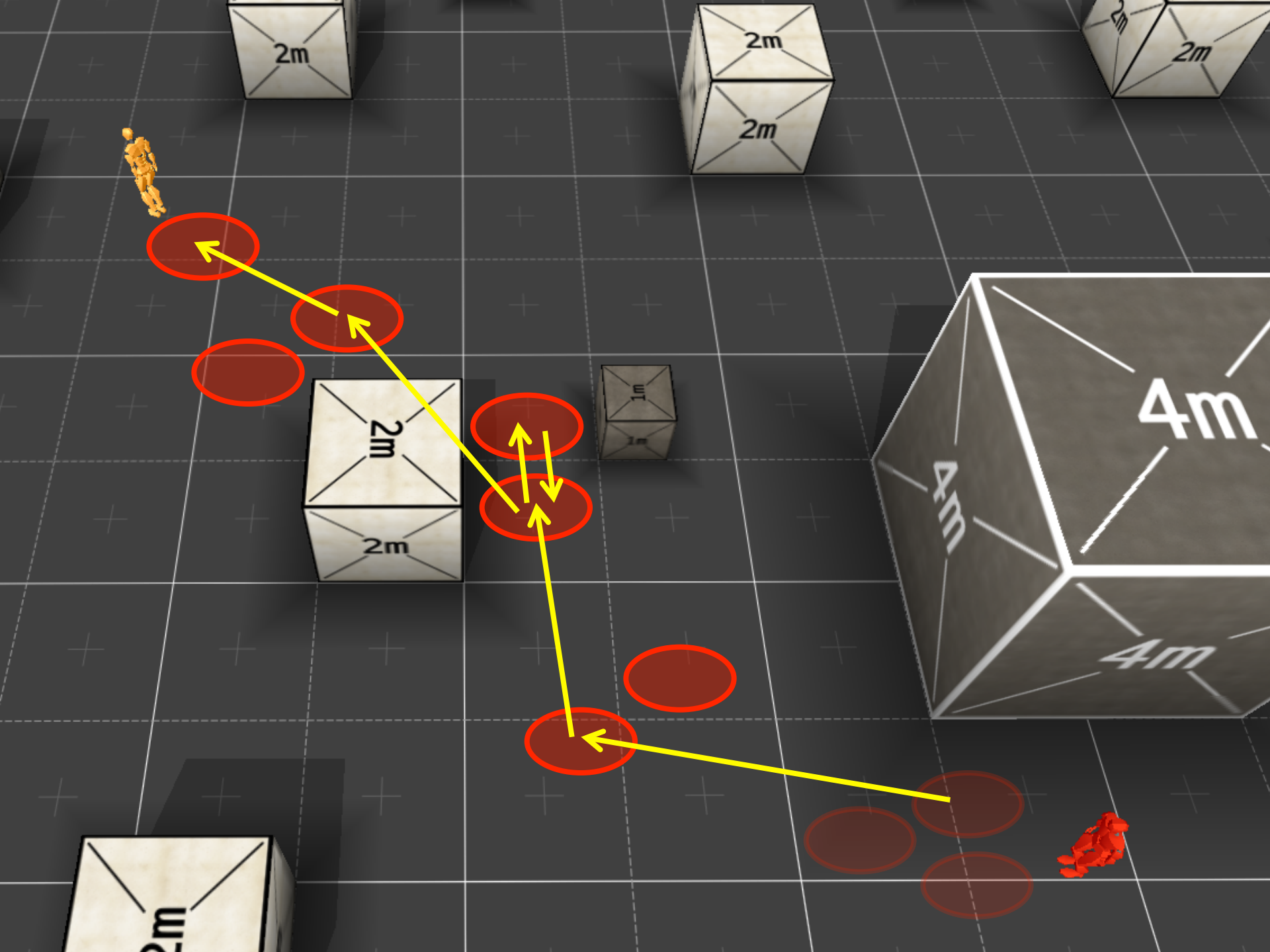
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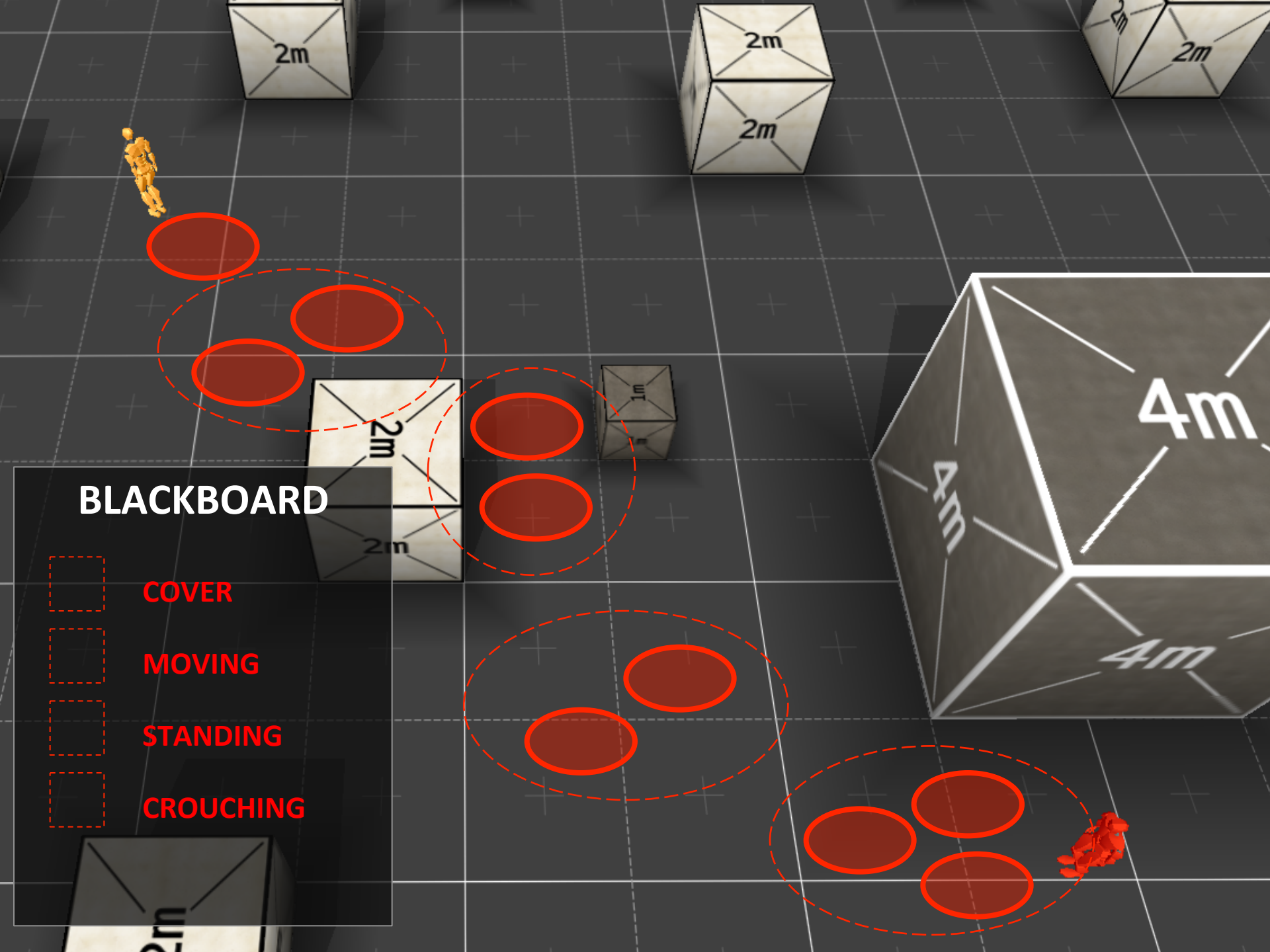
2m
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4m
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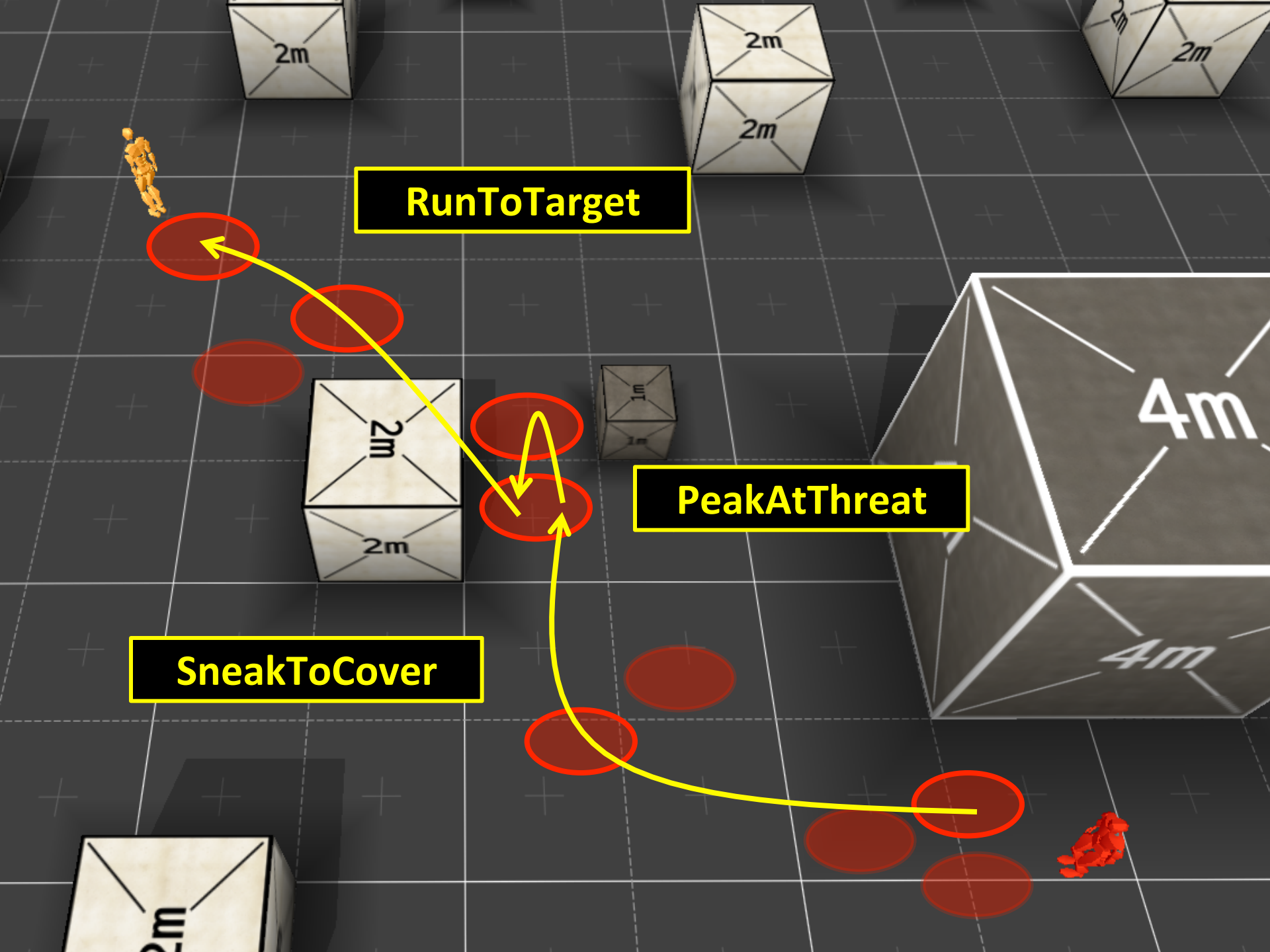
4m
BLACKBOARD
COVER
MOVING
STANDING
CROUCHING


RunToTarget
PeakAtThreat
SneakToCover
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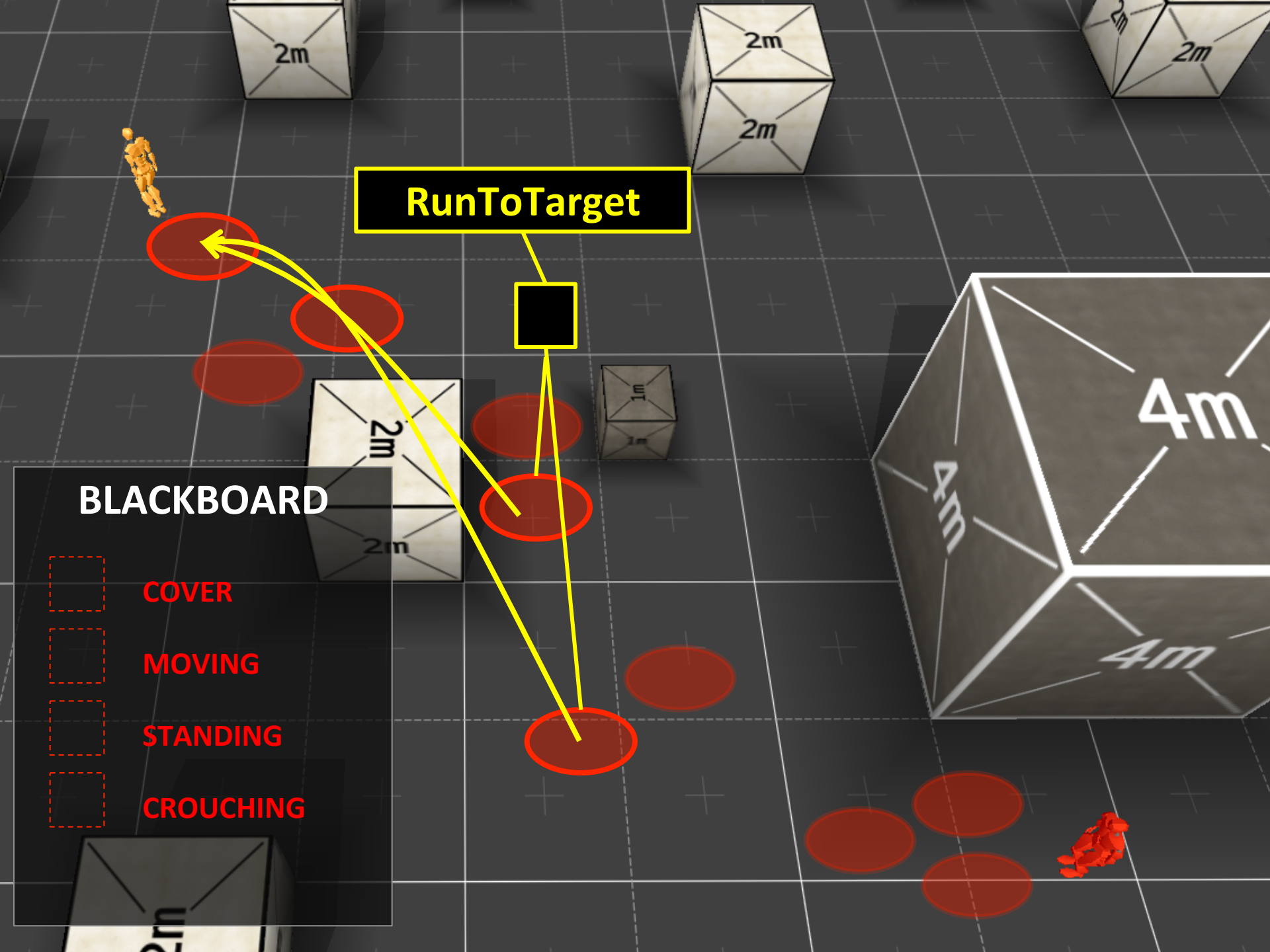
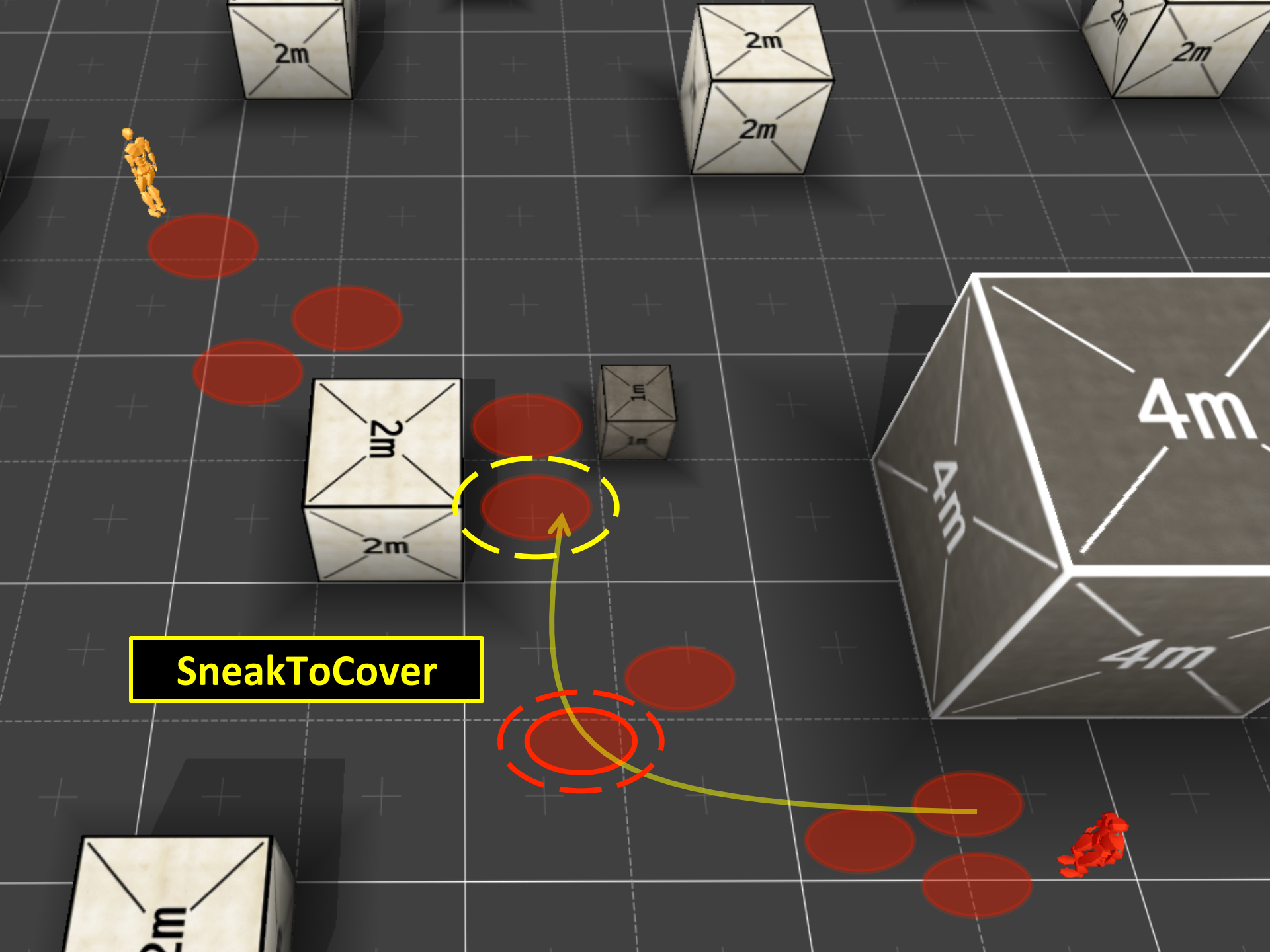

RunToTarget
BLACKBOARD
COVER
MOVING
STANDING
CROUCHING
2m
4m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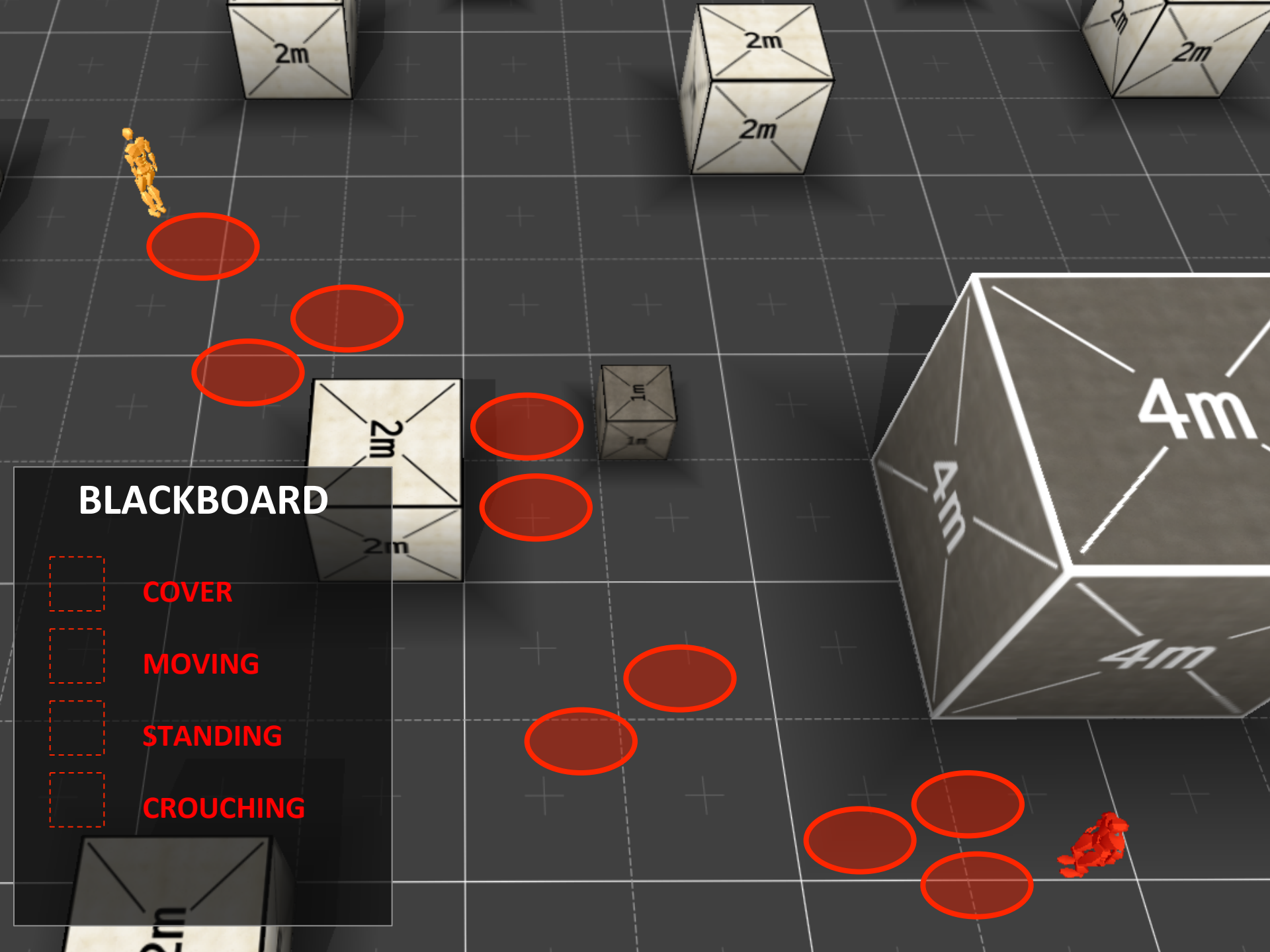
SneakToCover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4m
BLACKBOARD
COVER
MOVING
STANDING
CROUCHING

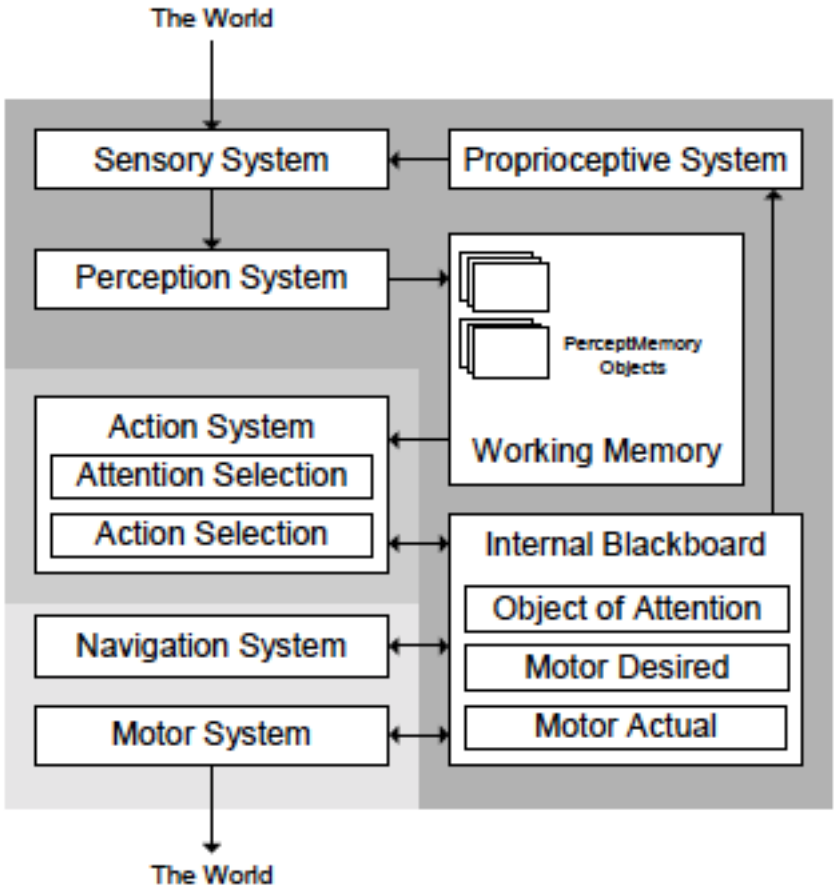
Défis scientifiques et techniques pour les personnages non-joueurs

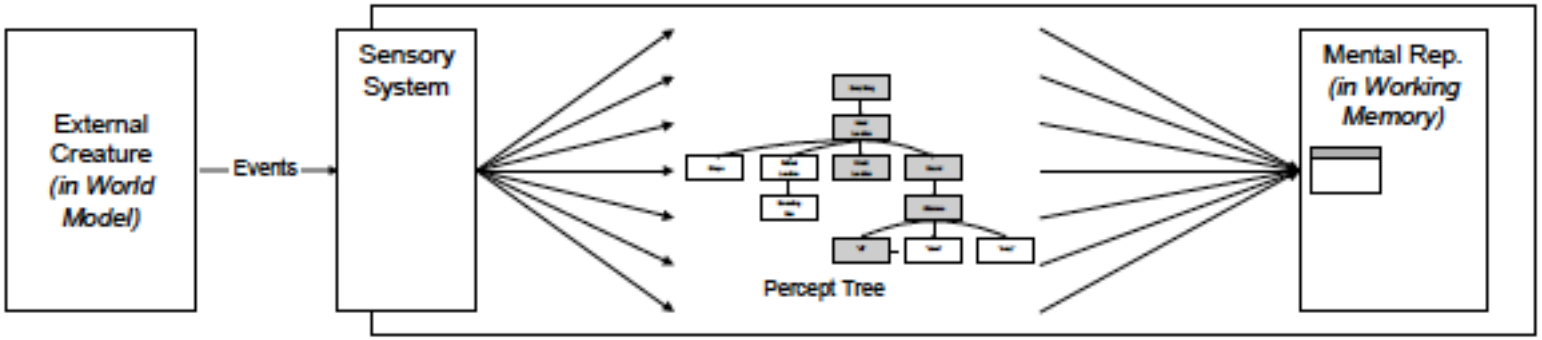
- *Robust*. They can base decisions on imperfect knowledge of the world.
- *Reactive*. They can react appropriately to sudden changes in their environment.
- *Adaptable*. They can learn from their experience of the world.
- *Honest*. They possess enough perceptual integrity to be surprised when things don't go as planned.
- *Expressive*. They have personality, can express their surprise and remain in character.
- *Sensible*. They display some basic common sense, regardless of their personality.
- *Scalable*. How about a whole pack of creatures like that?

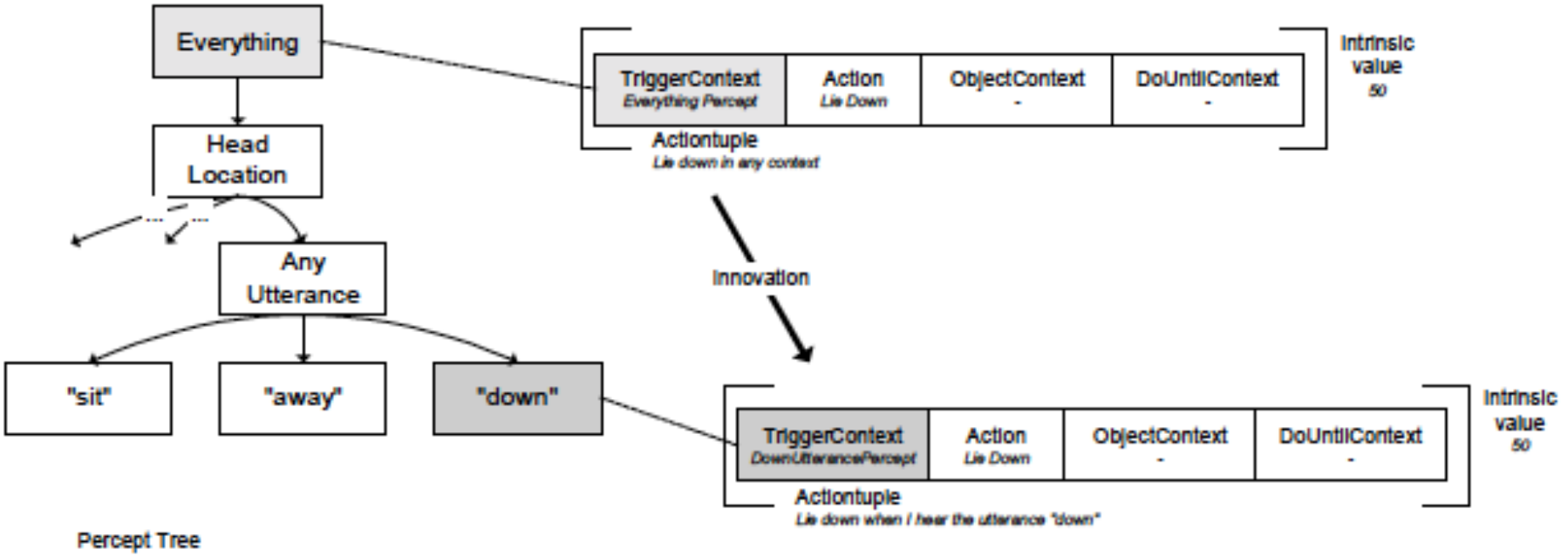
Solution : donner un cerveau aux personnages non joeuurs

Creature Smarts: The Art and Architecture of a Virtual Brain

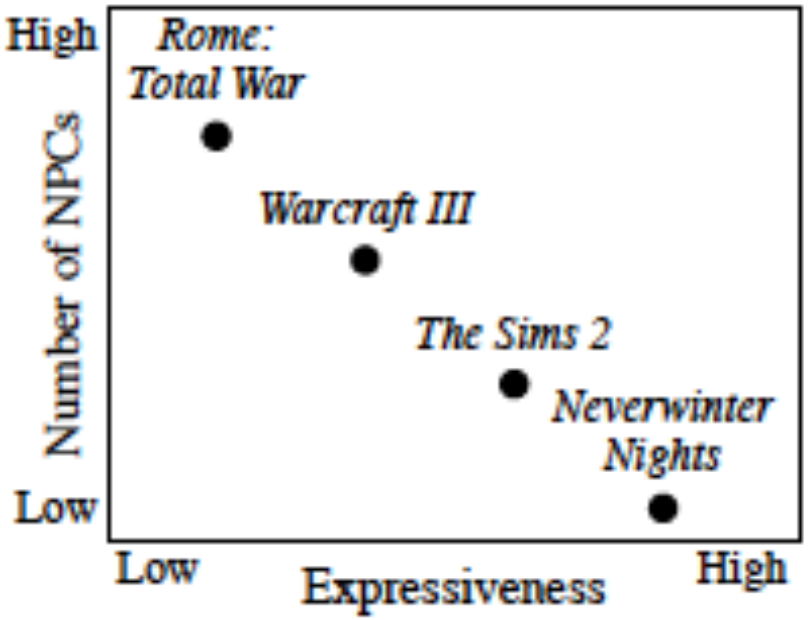
Robert Burke rob, Damian Isla naimad, Marc Downie marcd, Yuri Ivanov yivanov, Bruce Blumberg bruce@media.mit.edu




External Creature (in World Model)
Events
Sensory System
Percept Tree
Mental Rep. (in Working Memory)

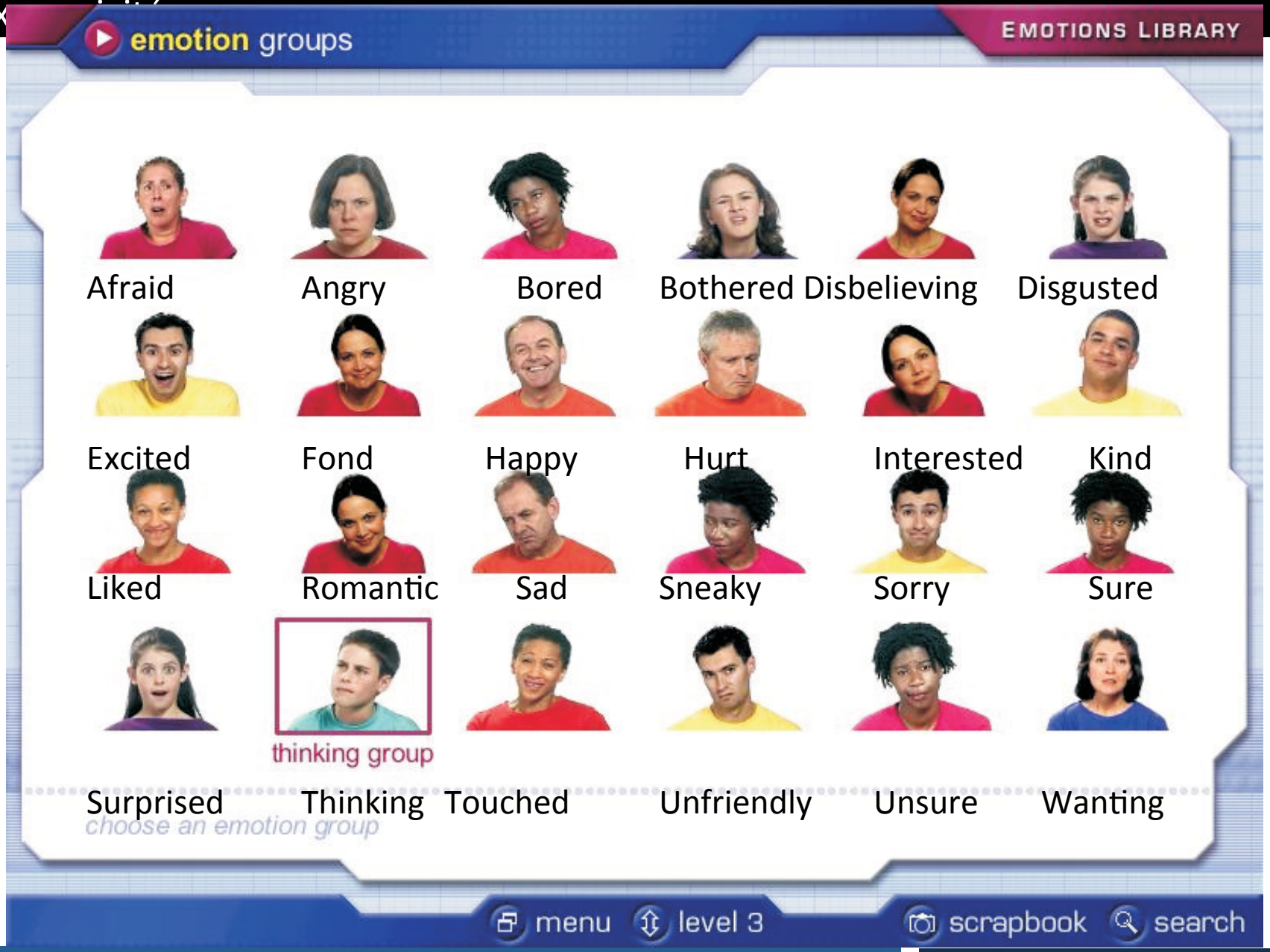

Everything
Head Location
Any Utterance
"sit"
"away"
"down"
TriggerContext
Everything Percept
Action
Lie Down
ObjectContext
-
DoUntilContext
-
Intrinsic value
50
Actiontuple
Lie down in any context
Innovation
TriggerContext
DownUtterancePercept
Action
Lie Down
ObjectContext
-
DoUntilContext
-
Intrinsic value
50
Actiontuple
Lie down when I hear the utterance "down"
Percept Tree

Passage à l'échelle



Source: White et al. Scaling games to epic proportions. SIGMOD 2007.

Ex


emotion groups
EMOTIONS LIBRARY
Afraid
Angry
Bored
Bothered
Disbelieving
Disgusted
Excited
Fond
Happy
Hurt
Interested
Kind
Liked
Romantic
Sad
Sneaky
Sorry
Sure
thinking group
Surprised
Thinking
Touched
Unfriendly
Unsure
Wanting
choose an emotion group
menu
level 3
scrapbook
search

- Levels expressifs/émotionnels
  - level 1: equivalent to a typical 4 to 7-year-old
  - level 2: equivalent to a typical 8 to 10-year-old
  - level 3: equivalent to a typical 11 to 13 -year-old
  - level 4: equivalent to a typical 14 to 16-year-old
  - level 5: equivalent to a typical 17 to 18-year-old
  - level 6: suitable for an advanced user (typically an adult).
- Source: Mindreading Emotions Library, Univ. Cambridge.

Emotions et niveaux

Group	*level 1*	*level 2*	*level 3*	*level 4*	*level 5*	*level 6*
Afraid	afraid worried	desperate nervous threatened	cowardly dreading frantic jumpy panicked terrified watchful	daunted disturbed intimidated shaken uneasy vulnerable		consternation cowed discomforted
Angry	angry grumpy moaning moody	annoyed complaining furious wild	displeased explosive frustrated	bitter discontented exasperated heated indignant infuriated provoked	miffed needled	
Bored	bored		unimpressed distant	blank distracted inattentive unenthusiastic unfocused vague	complacent indifferent jaded listless passive vacant	

Emotions et niveaux

Group	*level 1*	*level 2*	*level 3*	*level 4*	*level 5*	*level 6*
Bothered			bothered impatient	flustered pestered restless tense	ruffled	
Disbelieving			disbelieving doubtful questioning suspicious	cautious cynical guarded		incredulous
Disgusted	disgusted			distaste revulsion		
Excited	excited	adventurous lively	enthusiastic keen	alert aroused hysterical inspired refreshed spirited	exhilarated invigorated vibrant	ardour titillated

Emotions et niveaux

Group	*level 1*	*level 2*	*level 3*	*level 4*	*level 5*	*level 6*
Fond	liking fond	loving trusting	affectionate close respectful	adoring devoted	cherishing	affinity
Happy	comfortable glad happy joking lucky merry safe teasing	calm cheeky cheered delighted enjoying fine grateful overjoyed playful pleasure proud relaxed	amused content easy-going mischievous positive relieved	carefree casual sociable triumphant unconcerned	jubilant	exonerated
Hurt	bullied hated hurt	attacked blamed cheated ignored	betrayed broken criticized disbelieved disliked disrespected	abused battered compelled corrected demoralized downtrodden exploited neglected offended terrorized tortured	confronted contradicted deflated deserted patronized scorned	aggrieved belittled discredited

Emotions et niveaux

Group	*level 1*	*level 2*	*level 3*	*level 4*	*level 5*	*level 6*
Interested	asking believing interested listening	concentrating	absorbed curious fascinated impressed tempted	admiring vigilant	awed lured spellbound	
Kind	friendly helpful kind polite	caring giving	calming cheering comforting concerned encouraging forgiving patient understanding warm welcoming willing	congratulatory pitying	empathic	

Emotions et niveaux

Group	*level 1*	*level 2*	*level 3*	*level 4*	*level 5*	*level 6*
Liked	liked	forgiven welcomed	adored appreciated comforted included needed praised rewarded supported wanted	accepted flattered reassured		
Romantic			attracted bewitched romantic	attractive enticed flattering flirtatious intimate passionate	entrancing seduced seductive	
Sad	lonely lost sad tired upset	disappointed tearful	discouraged gloomy heartache heartbroken homesick hysterical troubled weak withdrawn	despairing devastated disillusioned dismayed distraught empty grieving resigned	agonizing anguished condemned grave overwrought pining subdued tormented turmoil	maudlin

Emotions et niveaux

Group	*level 1*	*level 2*	*level 3*	*level 4*	*level 5*	*level 6*
Sneaky	sneaky	lying	humouring mysterious tempting	calculating concealing deceitful	insincere luring	fawning
Sorry	sorry	ashamed embarrassed guilty	responsible	humiliated	mortified	
Sure	honest strong sure	bossy decided serious	competitive persuaded prepared pushy stubborn	arrogant assertive cocky committed convinced determined knowing smug	composed	sang-froid
Surprised	surprised	shocked	dazed horrified startled wonder	appalled	scandalized	
Thinking	thinking	dreamy thoughtful	judging	brooding calculating comprehending expectant fantasizing choosing		

Emotions et niveaux

Group	*level 1*	*level 2*	*level 3*	*level 4*	*level 5*	*level 6*
Touched			soppy touched	overcome sentimental	nostalgic	
Unfriendly	bullying difficult hateful mean unfriendly unkind	blaming cold cruel disliking ignoring scolding selfish threatening violent	aggressive argumentative detesting disapproving disrespectful humiliating rude uncaring	condemning contemptuous contradictory defiant despising discouraging gleeful hostile judgemental rejecting remote sarcastic unapproachable	brazen condescending contrary disinclined oppressive pitiless resentful sadistic stern unreceptive vindictive	animosity belittling haughty supercilious

Emotions et niveaux

Group	*level 1*	*level 2*	*level 3*	*level 4*	*level 5*	*level 6*
Unsure	shy silly unsure	confused puzzled uncomfortable	clueless undecided	baffled bemused bewildered disorientated hesitant humble inadequate insecure modest reluctant self-conscious so-so	mystified subservient	ambivalent deferential self-deprecating
Wanting	greedy wanting	begging hopeful jealous	demanding wishful	appealing needy		suppliant

Cinématographie et montage intelligents

Virtual Cinematography
Theory and Practice for Automatic Real-Time Camera Control and Directing

By Liwei He, Microsoft Research

- http://research.microsoft.com/users/lhe

Intelligence artificielle des SIMS

- Modeling individual personalities (Richard Evans)

Emergent narrative : Alice and Kev by **Robin Burkinshaw**

Kev, the father, is mean-spirited and highly inappropriate

- **Alice, his daughter, is sweet, kind, forgiving**

Intelligence artificielle des SIMS

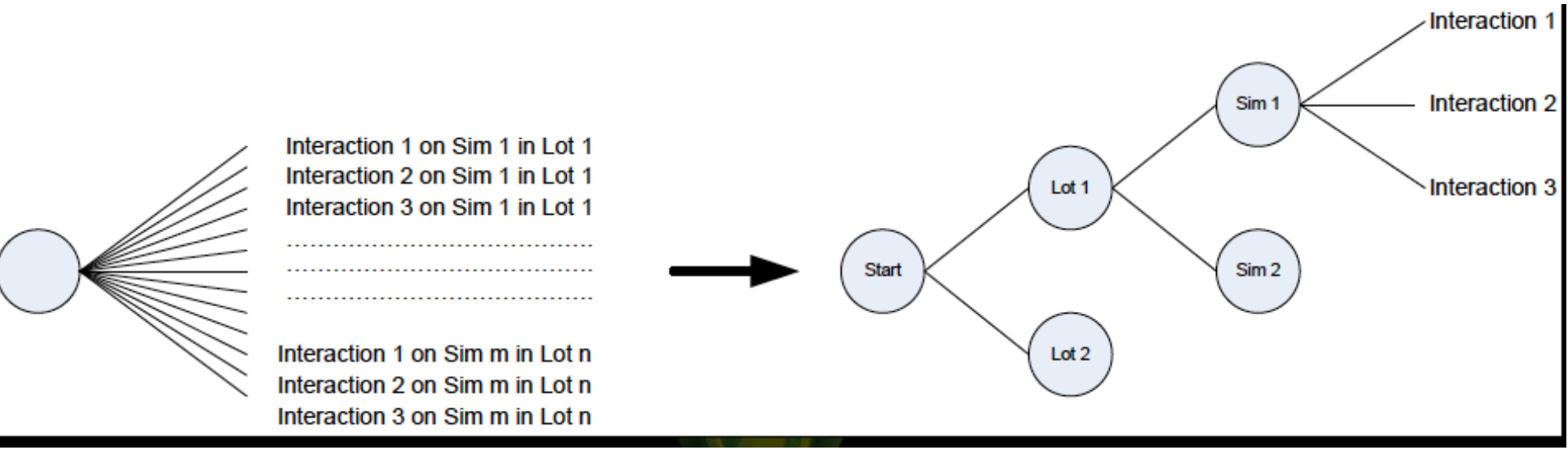
- Planification hiérarchique
- Carte des buts et interactions
- Décisions non déterministes
- Personalités et motivations
- Actes de langages et situations sociales
- Progression narrative et dramaturgie

Planification hiérarchique

- Réduire le nombre de choix

for each lot l
for each agent x in l
for each social interaction a on x
consider performing a on x

Choose which lot to go to: l
Then choose which agent to talk to in l : x
Then choose which social interaction to perform : a



Commodity-interaction maps

Sims 1 & 2 :

- **for each interaction a on each object x**
  - **check if a is currently available on x**
    - **if so, work out how much I want to do a**

Sims 3 :

Consulter une « carte » des buts (commodities) et actions associées

Commodities and interactions

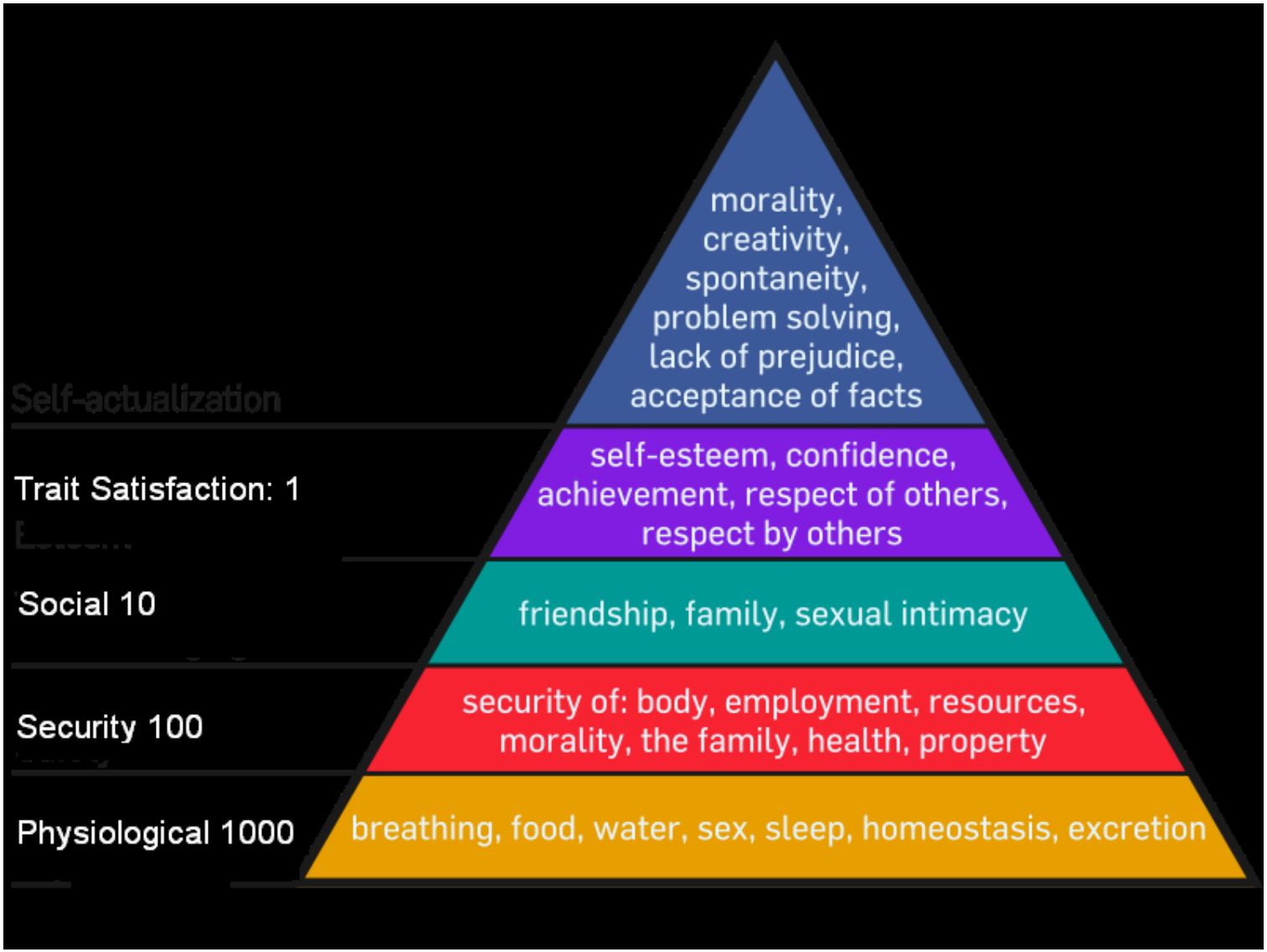
Commodity	Interactions
Bladder	Use(ToiletStall) Use(ToiletStall) Use(ToiletStall) Use(ToiletStall)
Hunger	Have Refreshing Drink(BarModern) Have Refreshing Drink(BarModern) (FridgeDrawer) (FridgeDrawer)
Energy	Nap(ChairLivingDesigner) Nap(ChairLivingDesigner) Drink Delicious Half-Caf Chocolate Lite Frothiccino with Caramel Spri
Hygiene	Take Shower(ShowerLoft) Take Bath(BathtubModern) Take Delightful Bubble Bath(BathtubModern) Take Shower(Shower
Fun	Pump Iron(WorkoutBench) Dance(StereoExpensive) Turn On(StereoExpensive) Strength Training(StereoExpensive) Take
Dirtiness	Clean(C4) Clean(C6) Clean(ShowerLoft) Clean(BathtubModern) Clean(ToiletStall) Clean(ToiletStall) Take Out Trash(Trash
Social	Train (WorkoutBench) (WorkoutBench) Train (StereoExpensive) (StereoExpensive) Train Buster(TVWall) (TVWall) Train (
ComeAndSee	Check Out New Object(Pool)
DaredevilOnDare	Take Shower(ShowerLoft) Take Shower(ShowerLoft) Take Shower(ShowerLoft) Take Shower(ShowerLoft)
ExtinguishSelf	Put Out Self(ShowerLoft) Put Out Self(ShowerLoft) Put Out Self(ShowerLoft) Put Out Self(ShowerLoft) ***** Gameplay/Abstract
SwimmingInPoolMotive	***** Gameplay/Abstracts/ScriptObject/GetInPool:InteractionName *****(Pool) Swim(Pool)
PrepareForParty	Clean(C4) Clean(C6) Clean(ShowerLoft) Turn On(StereoExpensive) Clean(BathtubModern) Clean(ToiletStall) Clean(ToiletS
BeHostAtParty	Make Refreshing Drinks(BarModern) Make Refreshing Drinks(BarModern) (FridgeDrawer) Serve Delightful Hot Beverage
ChildEnjoyParty	Play Video Game(TVWall)
TeenEnjoyParty	Dance(StereoExpensive) Turn On(StereoExpensive)
AdultEnjoyParty	Dance(StereoExpensive) Turn On(StereoExpensive)
PrepareForFuneral	Clean(C4) Clean(C6) Clean(ToiletStall) Clean(ToiletStall) Clean(ToiletStall) Clean(ToiletStall) Clean(C457) Clean(C458)
BeGuestAtFuneral	Sit(ChairDiningModerate) Sit(ChairDiningModerate) Sit(ChairDiningModerate) Sit(ChairLivingDesigner) Sit(ChairLivingDesi
StayAtVenue	Sit(ChairDiningModerate) Sit(ChairDiningModerate) Sit(ChairDiningModerate) Sit(BathtubModern) Sit(ChairLivingDesigner)
BeInGym	Pump Iron(WorkoutBench) ***** Gameplay/Abstracts/ScriptObject/GetInPool:InteractionName *****(Pool) Work Out(Treadmi
BeInArtGallery	View(UberBoxPedestal) View(SculptureVaseContemporary) View(SculptureVaseContemporary) View(SculpturePlantPhilo
BeAtSwimmingPool	***** Gameplay/Abstracts/ScriptObject/GetInPool:InteractionName *****(Pool) Swim(Pool) Relax(ChairLoungeModern) Rela
BeSuspicious	Look In Window(WindowFullContemporary2x1) Look In Window(WindowFullContemporary2x1) Look In Window(WindowFu
BeMaid	Clean(C4) Clean(C6) Clean(ShowerLoft) Clean(BathtubModern) Clean(ToiletStall) Clean(ToiletStall) Take Out Trash(Trash
BeRepairman	Repair Shower(ShowerLoft) Repair(StereoExpensive) Repair(BathtubModern) Unclog(ToiletStall) Unclog(ToiletStall) Uncl
KeepSwimming	Swim(Pool)
RelieveNausea	Vomit(ToiletStall) Vomit(ToiletStall) Vomit(ToiletStall) Vomit(ToiletStall)

Comment les SIMS décident-ils de leurs actions ?

- Calculer l'utilité (score) de toutes les actions possibles
- Choisir avec une probabilité p = exp(S/T) -1

- **T is the temperature**
- **This is a simplified Boltzmann function**
- **Temperature should be cool when he is happy, and should go up when the Sim is doing badly**

Hiérarchie des motivations de Maslow



Motivations et traits de personalité

- **In Sims 1 & 2, every Sim had the same 8 motives**
- **In Sims 3, each Sim has a different set of motives, based on his traits**
- **But the set of motives doesn't just vary between individuals, it also varies within the *same individual* over time**
- **We add and remove motives through time, to model a Sim's understanding of social norms**

Jeu vidéo et interaction sociale

- **Sims 1 and 2 had very broad speech-acts**
  - **Talk, Joke**
- **In Sims 3, we have more specific social speech-acts**
  - **Compliment Home, Worry About Relationship**
- **These fine-grained social speech-acts allow us to express our fine-grained personalities**

Traits affect which social interactions they choose autonomously

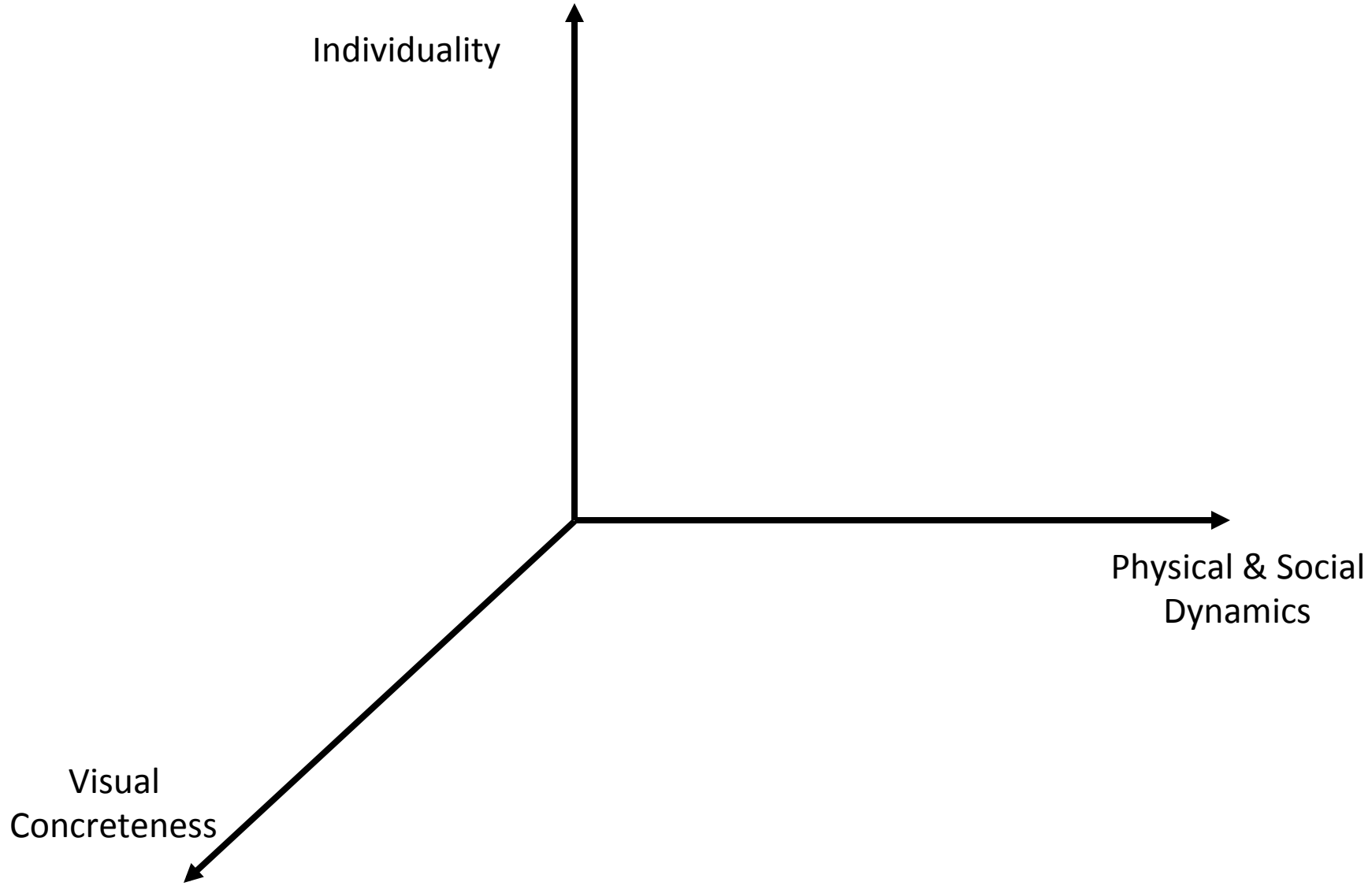
- Snobs like to boast about their cars
- Neurotic Sims will accuse their partner of cheating on them
- If a mean-spirited Sim finds out the person he is talking to is a vegetarian, he is apt to mock her vegetarianism!

Les SIMS agissent en fonction de leurs personnalités et des situations sociales

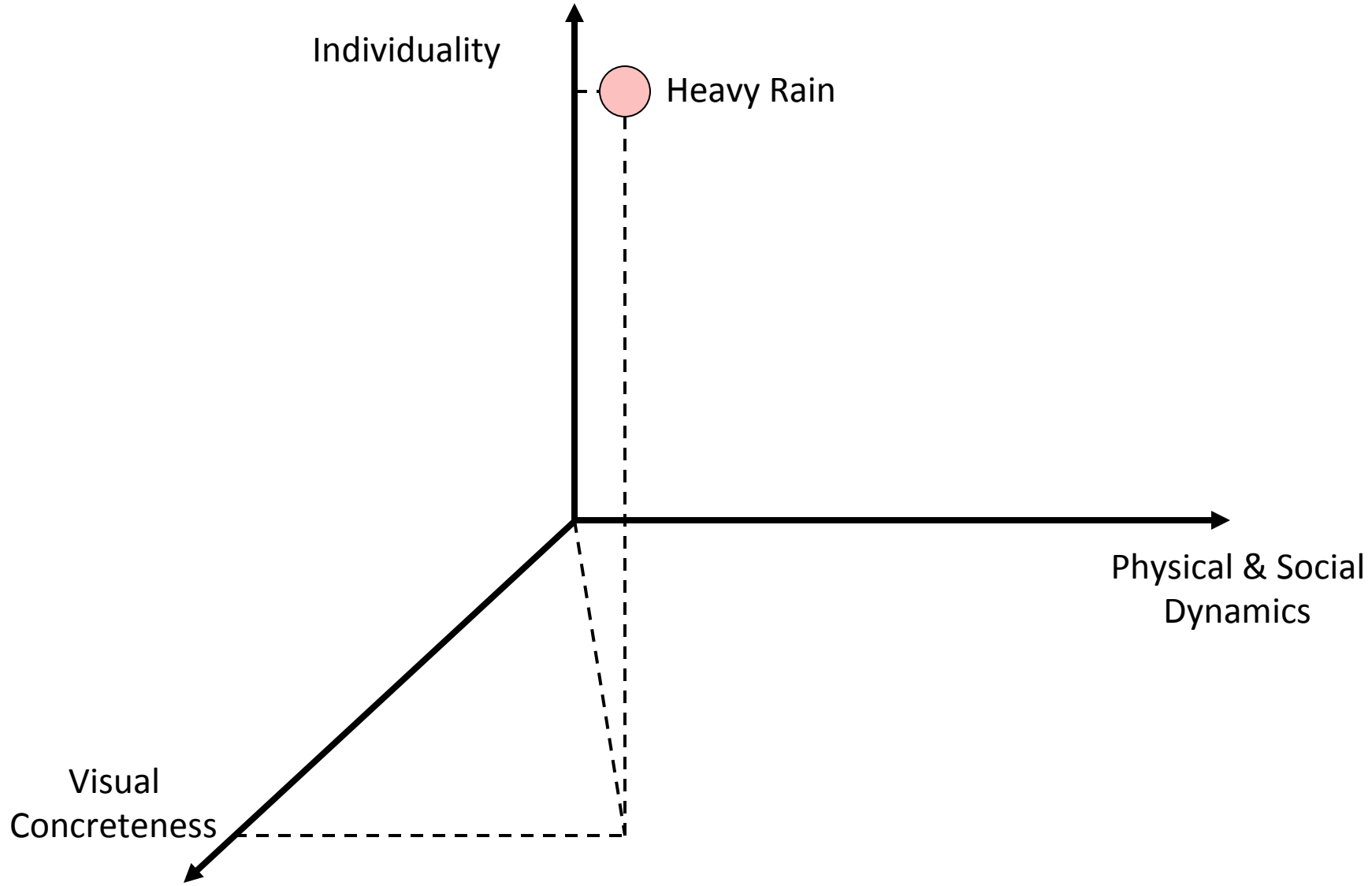
Social games beyond the SIMS

- Mass Effect
- Versu (Richard Evans, Emily Short)
- Heavy Rain (David Cage, Quantic Dream, Paris)
- Facade (Michael Mateas)

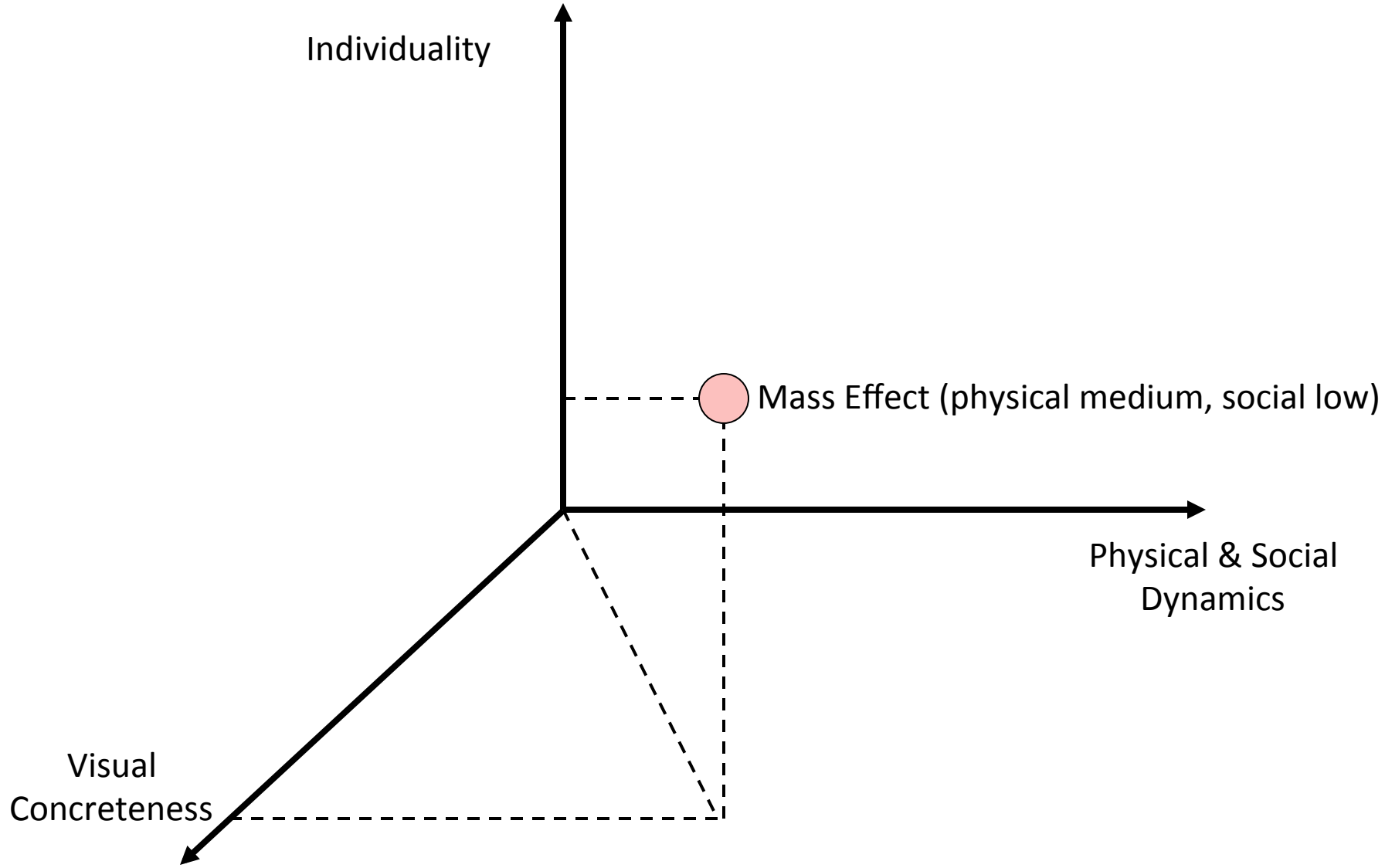
Character design space



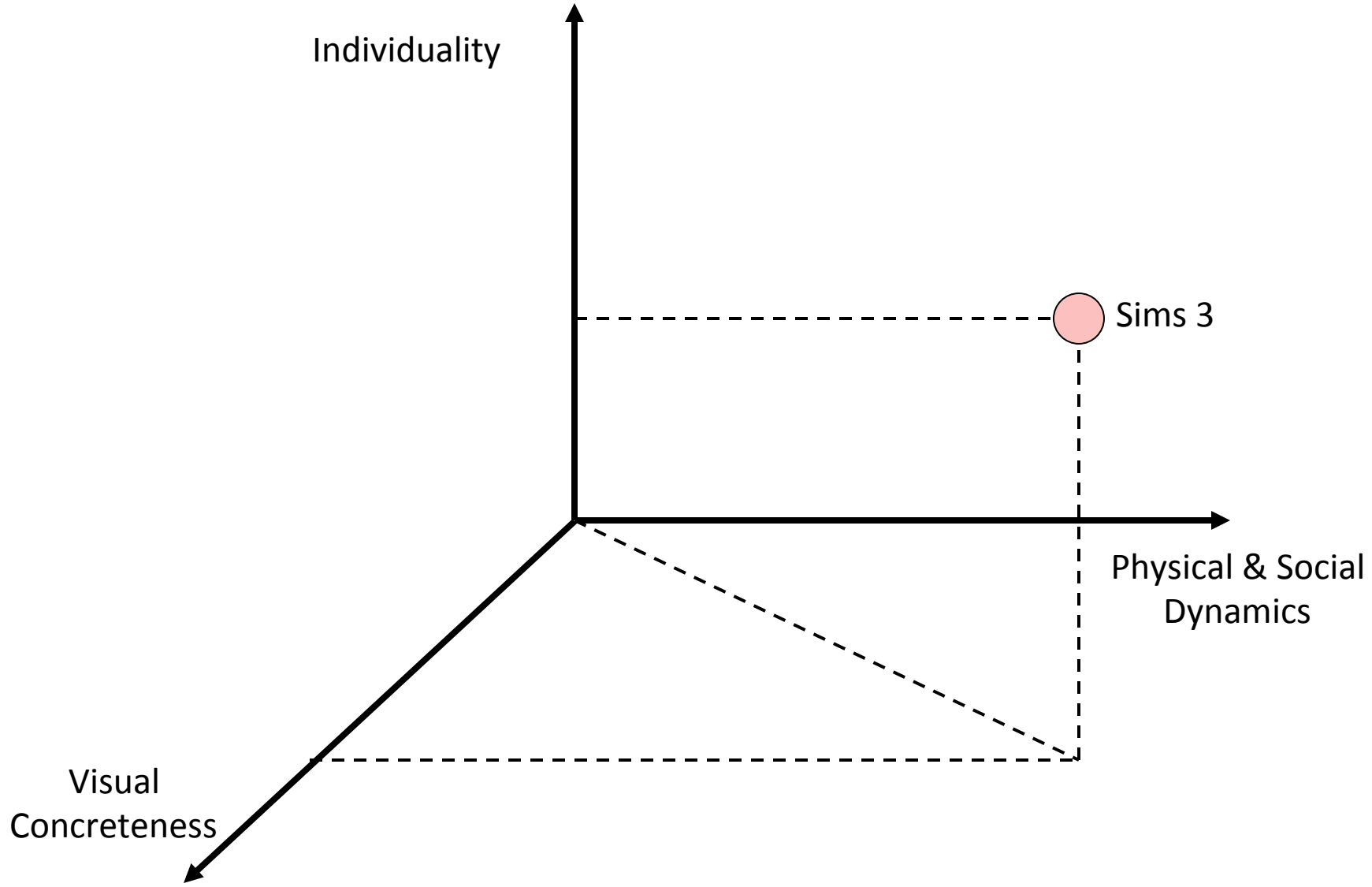
Character design space



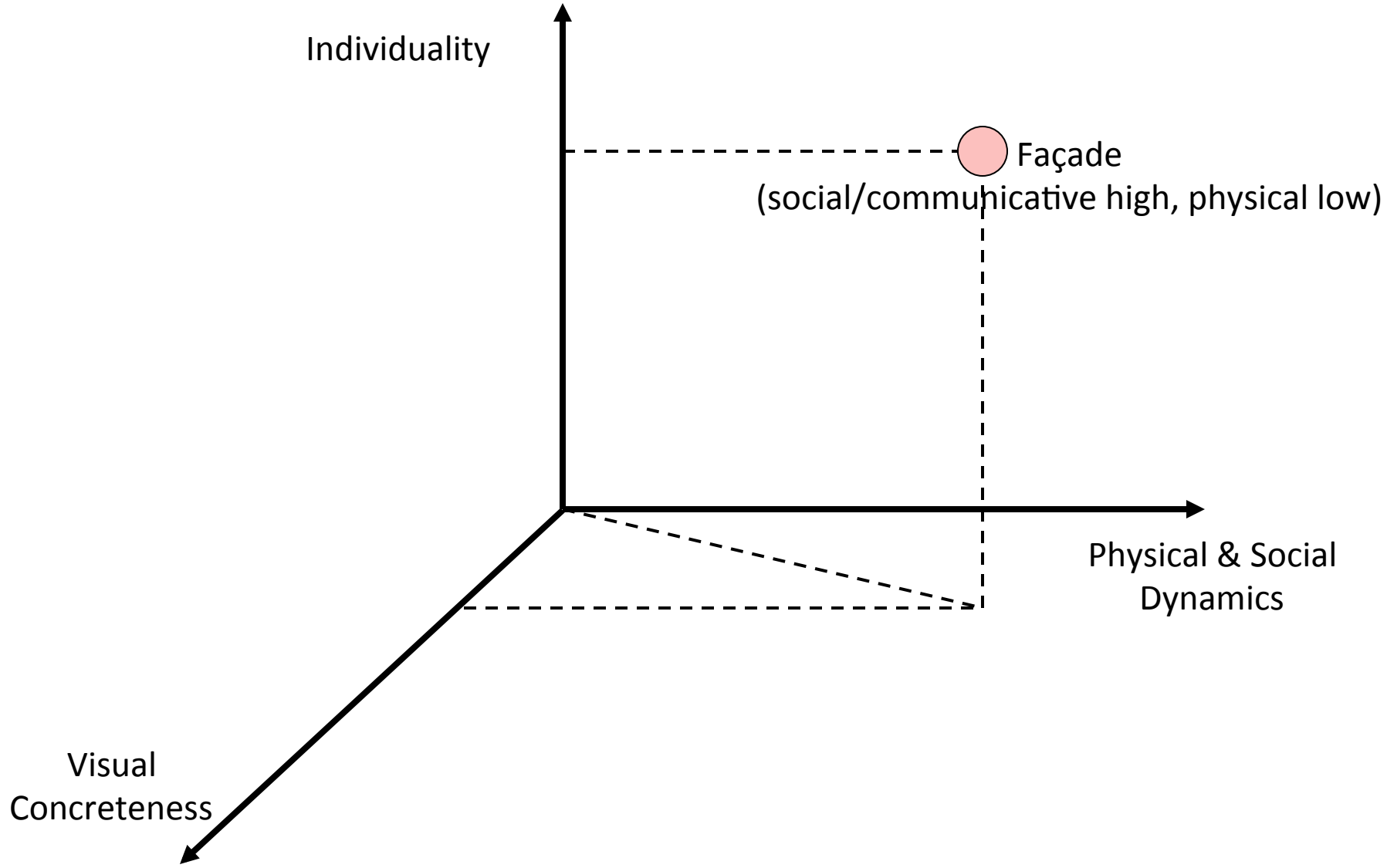
Character design space



Character design space



Character design space

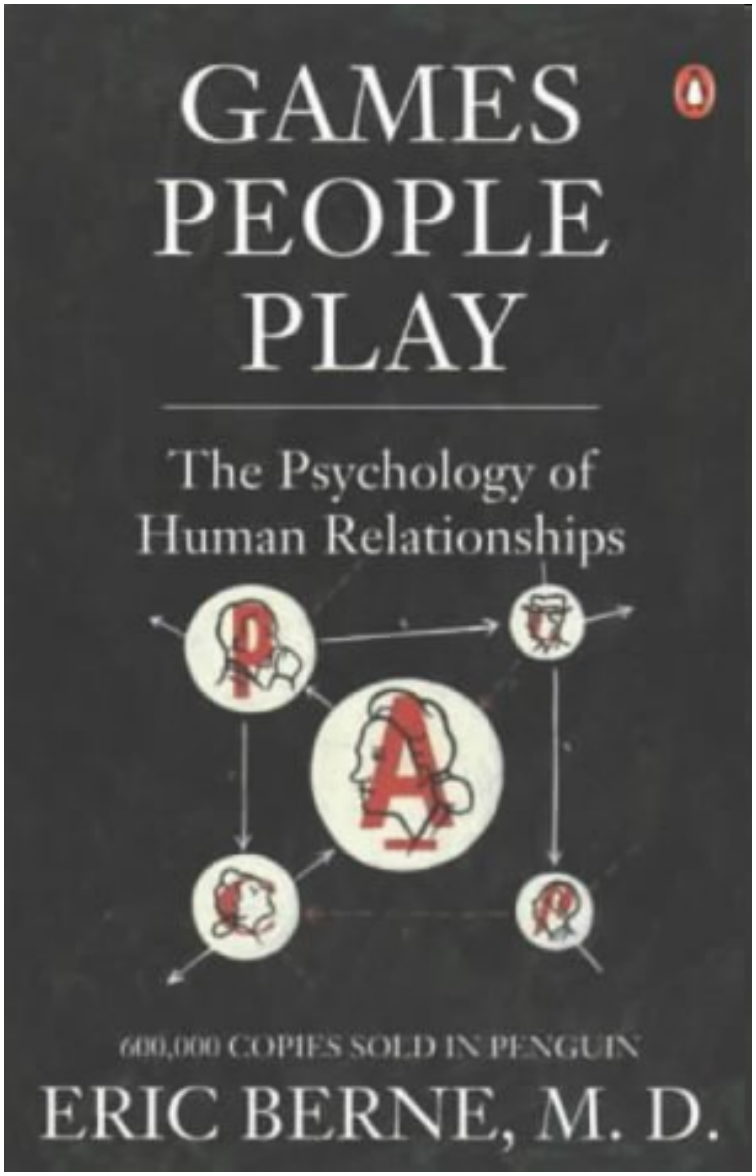


Zoomed in social behaviors

- Focus of this talk is zoomed-in social behavior

- This means
  - Interactions with dramatic potential
  - Detailed dialog
  - Detailed, playable social space

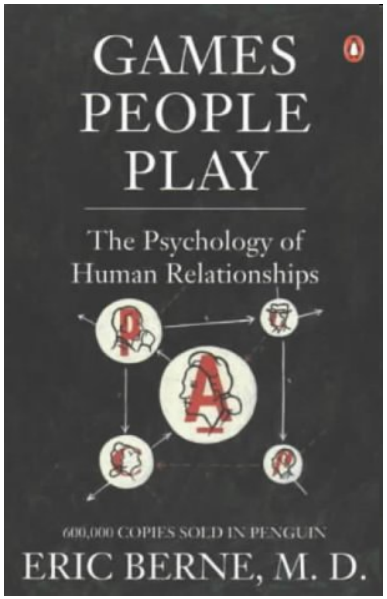
Façade


GAMES
PEOPLE
PLAY
The Psychology of
Human Relationships
600,000 COPIES SOLD IN PENGUIN
ERIC BERNE, M. D.

Façade's social games

- Affinity game
  - Player must take sides in character disagreements
- Hot-button game
  - Player can push character hot-buttons (e.g. sex, marriage) to provoke responses
- Therapy game
  - Player can increase characters' understanding of their problems
- Tension
  - Not a game, but dramatic tension increases over time and is influenced by player actions (e.g. pushing character hot-buttons can accelerate the tension)

Explicitly modeling social games



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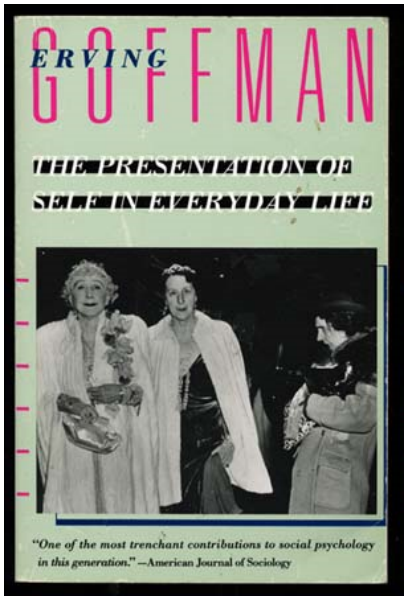

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= Models of social games

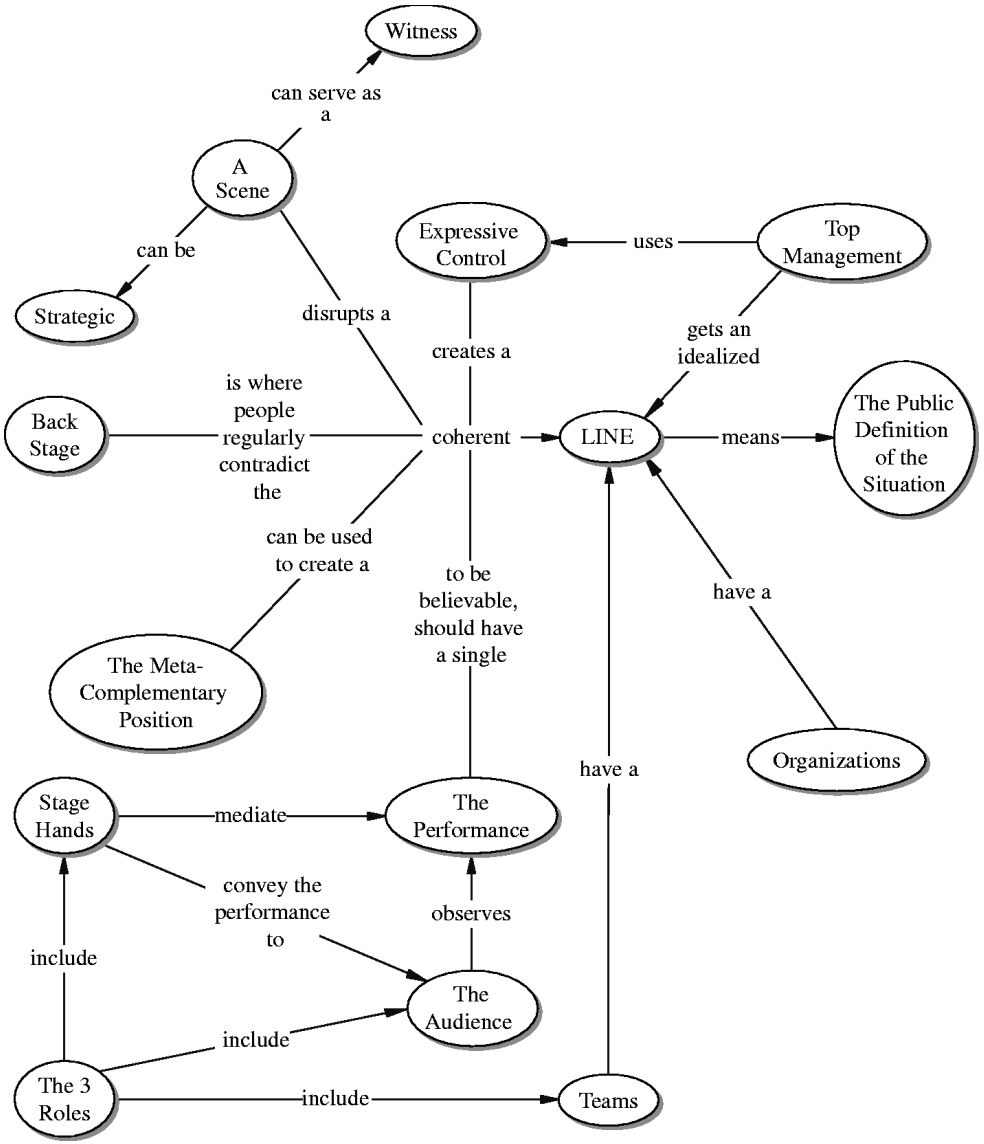
Definition of social game

A pattern of multi-agent interactions whose function is to modify the social state existing within and across the participants.

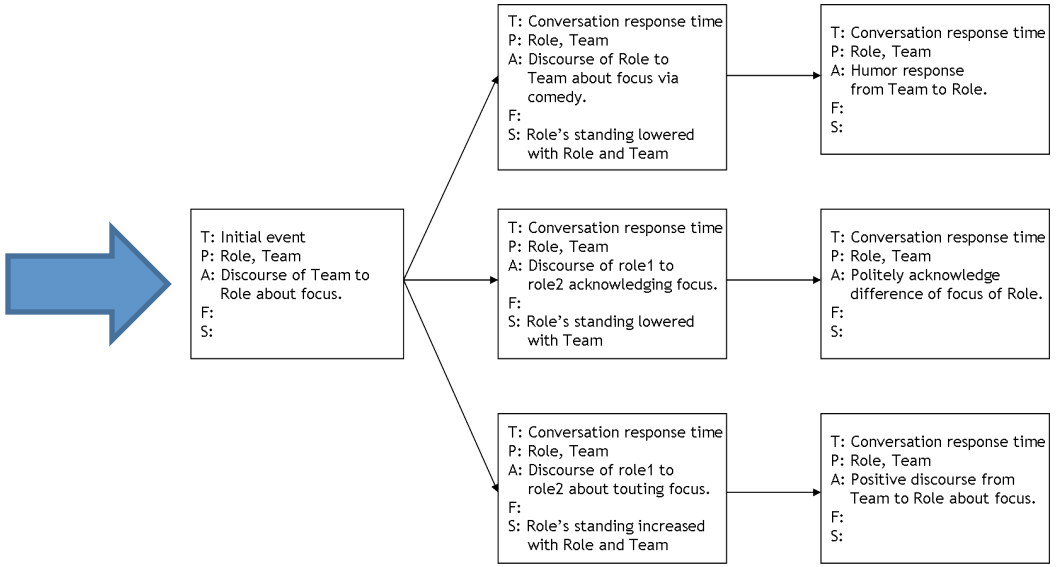
- Allows for agents to reason and perform in a social way to manipulate social state (includes social norm following)
- Interactivity – selection of game, current social state, and realization details influence oucome

Dramaturgical analysis

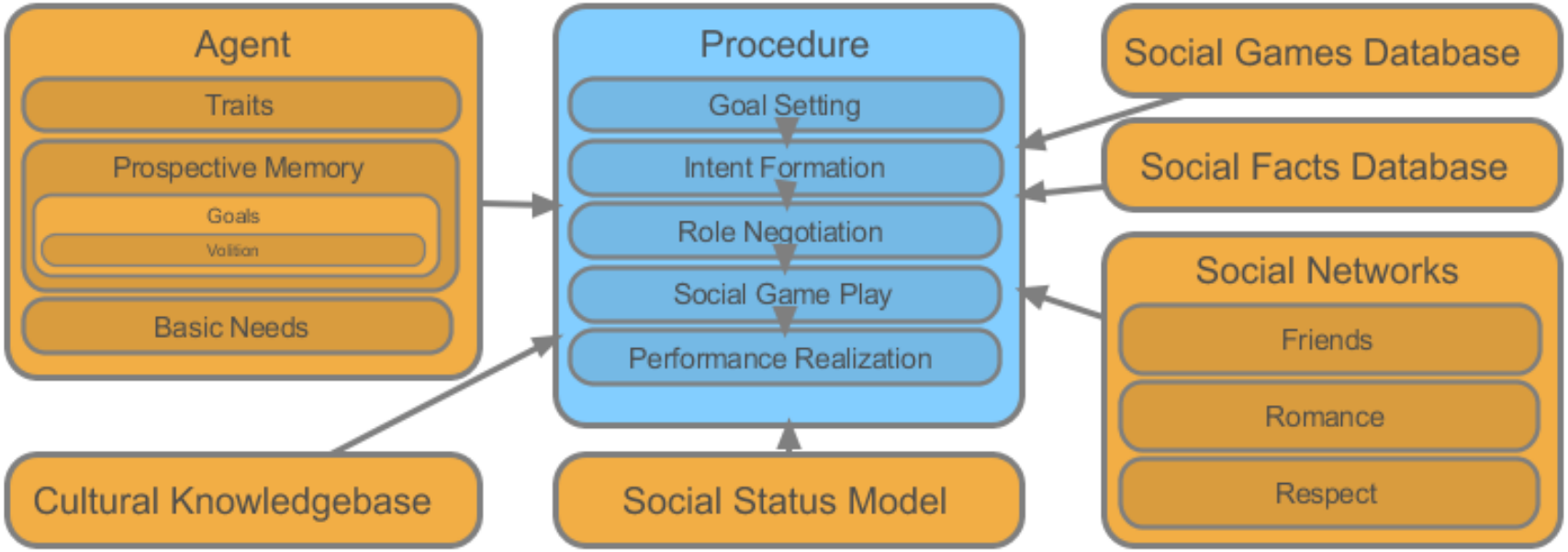
- Sociological tool for exploring reasons for behavior
- Impression management
  - Self-presentation
- Setting, stage, role, team, front/back stage, props, audience, etc.



Analyze media to find social games



Architecture



Social networks

- Our most primitive social state is captured by weighted edges in social network graphs
  - Each node is a character in the space
  - Each edge weight is the strength of the "affinity" that a character feels towards another

- We have three networks
  - **Relationship**: How much you like someone as a person (e.g. friends)
  - **Romance**: Interest in romantic endeavors (e.g. dating)
  - **Cool**: Respect for another.

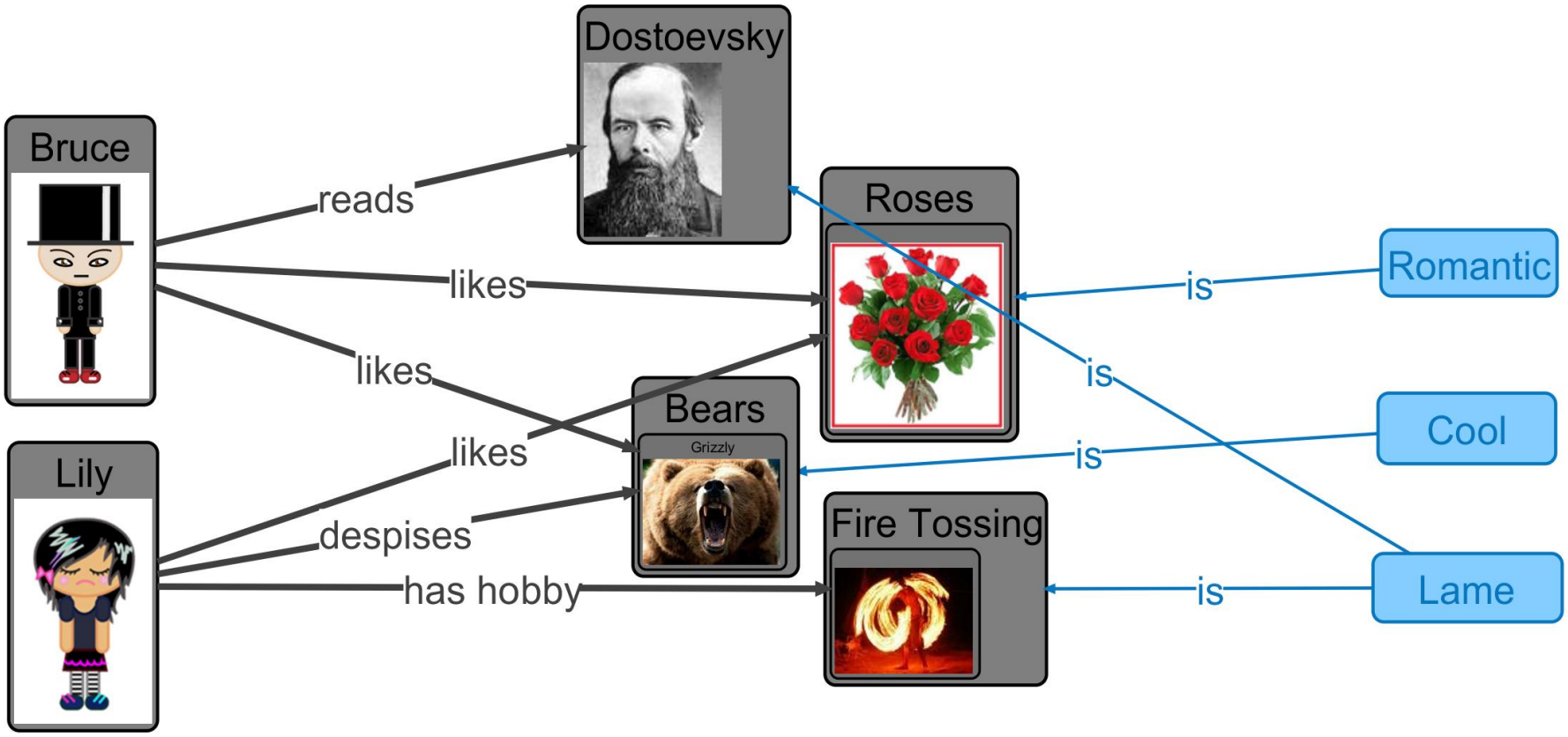
Social status

- Social status consists of higher-level social status that builds on the primitive social networks
- Inference rules chain from social networks to status

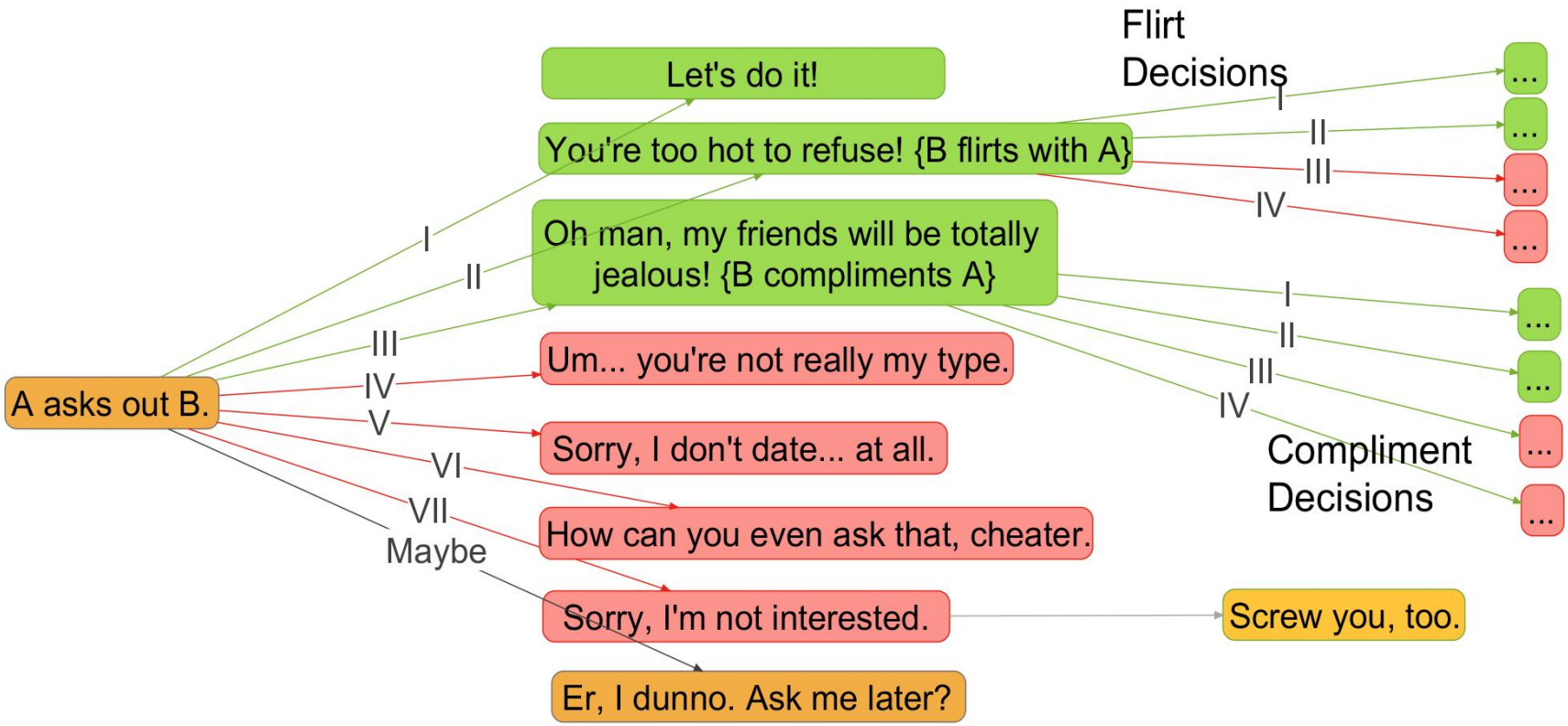
Dating(x,y) :- Rom(x,y) > 70 ^ Rom(y,x) > 70

Fighting(x, y) :- Enemy(x, y) ^ [NegativeAct(x,y)]
Fighting(x, y) :- Enemy(x, y) ^ [NegativeAct(x,z)] ^ Friends(y,z)
Fighting(x, y) :- Enemy(x, y) ^ [NegativeAct(x,z)] ^ Dating(y,z)

Cultural knowledge base



Social game example – "Ask Out"



For all friends f of B: avg(romantic(f,A)) > neutral → III
For all friends f of B: avg(cool(f,A)) > neutral → III
(rom(B,A) – threshold(Dating, rom)) < 0 → VII
trait(A, sex_magnet) → II (modifier high)
trait(B, desperate) → I (modifier medium)
...

Social facts database

Class	Word	A	B
1	dating	Kat	Rob
2	dating	Rob	Kat
4	friends	Kat	Miri
4	friends	Miri	Kat
6	broke up	Miri	Ed
6	broke up	Ed	Miri
2	took pass at	Rob	Ed
2	desires reconnect	Ed	Miri
7	dissed	Kat	Rob
7	insulted	Ed	Rob
8	fake story	Rob	Ed
11	spied on	Kat	Rob

Entry

Goal (chain back to status rule)

Specific game and path

Cultural knowledge used

Social facts used

Dialog templates with parameters

Take home

- Social games are a useful abstraction level for adding social dynamics to characters
- Holy grail of highly concrete, socially and physically dynamic, highly realized characters is still far way
  - For next several years, physical abstraction will be key for highly realized dynamic characters
  - Does not help AAA, but can incrementally add social dynamics

The field of computer graphics is more advanced than AI in games because graphics has a clean decomposition of form/function in terms of texture/polygon

- Graphics engineers deal with polygons
- Artists are free to add any texture they like

There is no analog in AI of the texture/polygon decomposition

Richard Evans (The SIMS, VERSU)

Pour aller plus loin