



**UFC**  
ULTIMATE FIGHTING  
CHAMPIONSHIP



Animation workflows for submission,  
fighter personality and locomotion features



# Introductions



**Lee Dowsett - UFC Animation Director**

**2000 - 2002 Hothouse Creations. Bristol, UK.**  
Casino Inc.

**2002 - 2004 Sony Europe. London, UK.**  
This is Football 2004 - 2005

**2004 - Present at Electronic Arts Canada**  
FIFA 06 - 07  
Facebreaker  
Fight Night 4 and Fight Night Champion  
EA Sports UFC



**Geoff Harrower - UFC Senior Lead Gameplay Engineer**

**2000 - Present at Electronic Arts Canada**

FIFA 02 – 07  
NHL 10  
Grand Slam Tennis  
NBA Live 11  
SSX  
EA Sports UFC





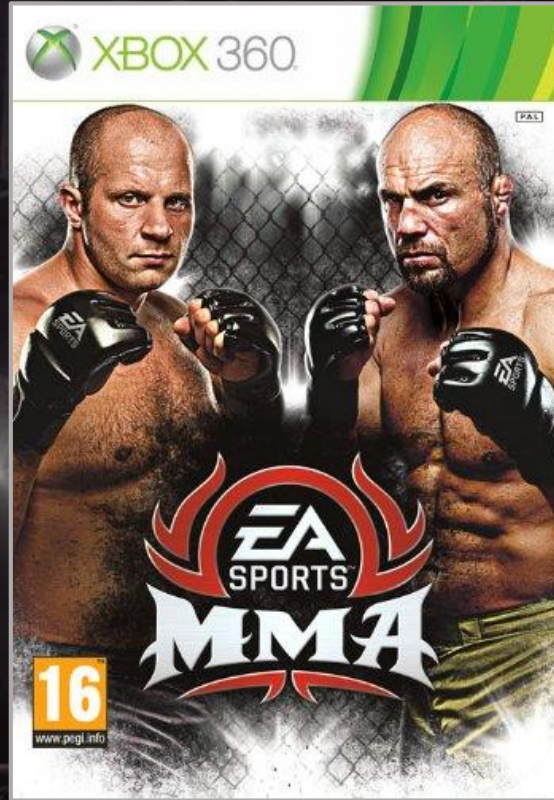
# Overview of the presentation

- Debt owed to EA Sports MMA
- Building the Right Team
- Workflows for
  - Submission
  - Locomotion
  - Character specific animation
- Still a long way to go to get things right...
- Improvements for UFC 2
- Questions





# Debt owed to EA Sports MMA



Access to the team's design documents

Access to their motion capture and animation library

Access to their ANT project including their custom interaction controller designs

Access to many of the original designers, engineers and animators



# Building the right team



Hire people that have expert knowledge and are passionate about MMA and the UFC

Push for fulltime employees, temporary solutions suck!

Knowledge share amongst your team

Train with professional fighters and instructors... lots

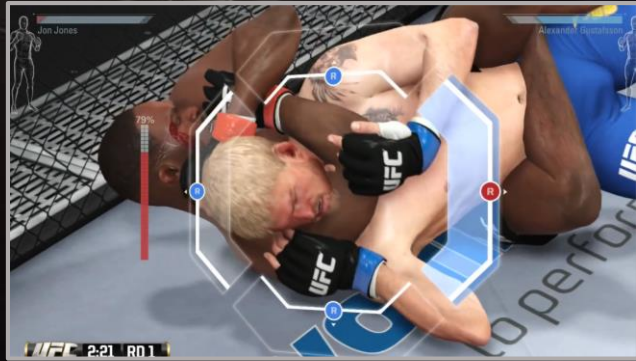
Research the sport in and out of the office



## **UFC Fan Expo 2013**

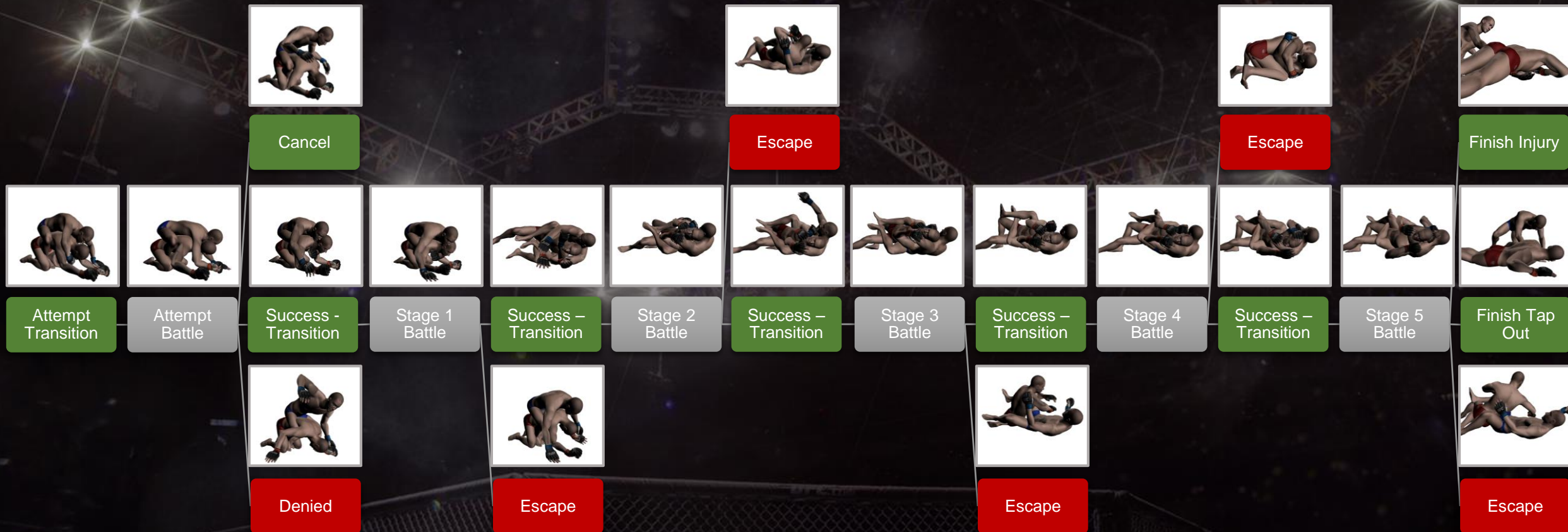
**EA SPORTS UFC Creative Director Brian Hayes meets  
8-0 UFC Women's Bantamweight Cat Zingano...**

# Division of a Submission





# Design



26 individual Submissions shipped in UFC 1

Each submission is made up of 21 two-man animations

All submissions have two to three alternate endings as well as escapes, denials and cancelations.

In mocap, we capture the complete submission with all six battles and then pick up the alternative endings and escapes separately

On average each submission would take 20 days of work from mocap cleanup to finally setting up in ANT

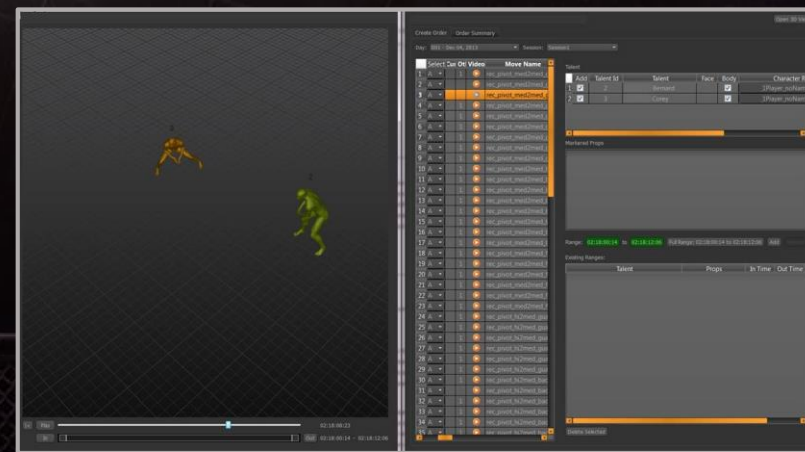
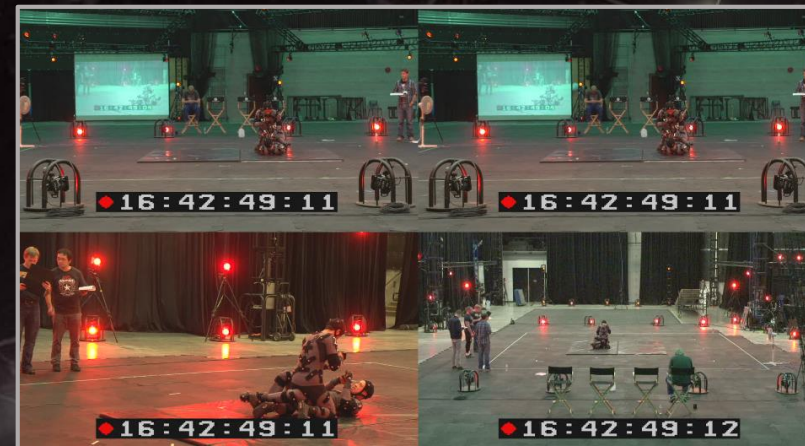


# Motion Capture



THE CAPTURE LAB

SHOT #	1	2	3	4	5	6	7	8	9	10	MOVE NAME
21324											ufc_fzp_g_fg_omoplate_break_05
21325											ufc_fzp_g_fg_triangle_break_05
21326											ufc_fzp_g_fg_triangle_break_05
21327											ufc_fzp_g_fg_dancehoke_break_05
21328											ufc_fzp_g_fg_dancehoke_break_05
21329											ufc_fzp_g_fg_kneebreak_break_05
21330											ufc_fzp_g_fg_kneebreak_break_05
21331											ufc_fzp_g_fg_gogoplate_break_05
21332											ufc_fzp_g_fg_gogoplate_break_05
21333											ufc_fzp_g_fg_omoplate_break_05
21334											ufc_fzp_g_fg_omoplate_break_05
21335											ufc_fzp_g_fg_american_break_05
21336											ufc_fzp_g_fg_american_break_05
21337											ufc_fzp_g_fg_invertedtriangle_break_05
21338											ufc_fzp_g_fg_invertedtriangle_break_05
21339											ufc_fzp_g_fg_kimura_break_05
21340											ufc_fzp_g_fg_kimura_break_05
21341											ufc_fzp_g_fg_american_break_05
21342											ufc_fzp_g_fg_american_break_05
21343											ufc_fzp_g_fg_american_break_05



Pick the right talent

Rehearse in advance of the shoot

Nail down your shot list and shooting order for the day

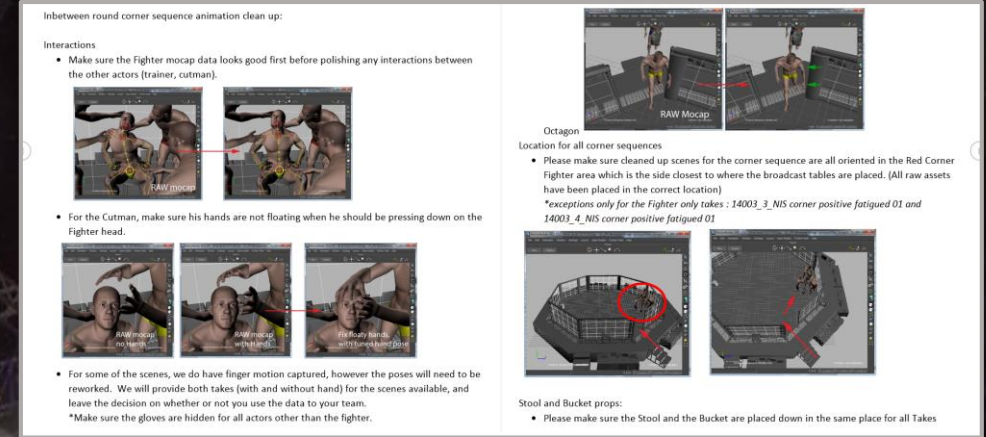
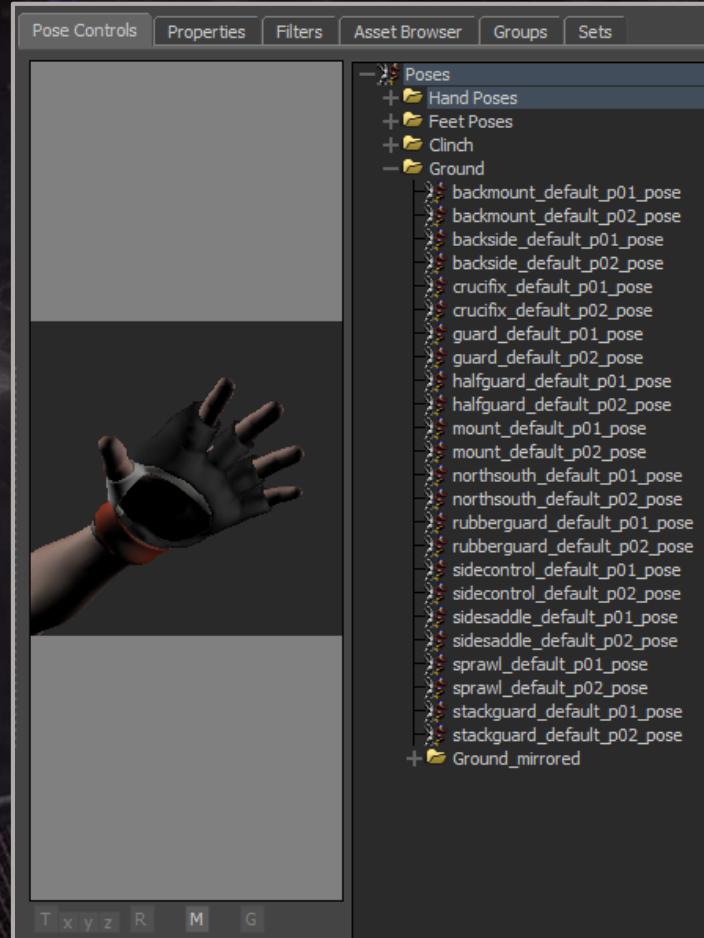
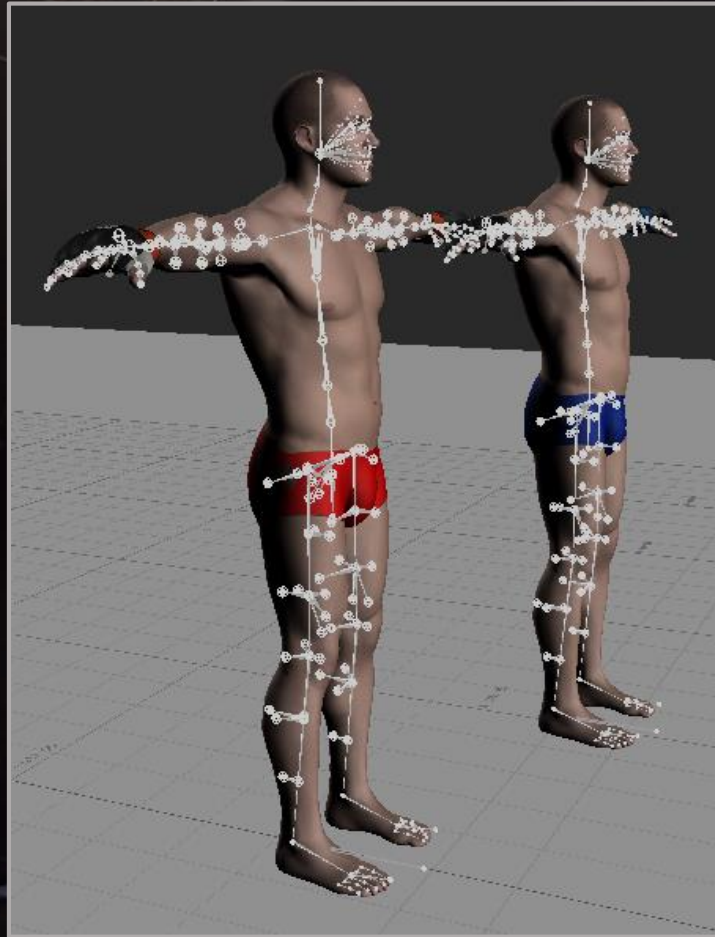
Provide plenty of reference before the shoot and on the day

Shoot reference footage of every shot from as many angles as you can

Order your data as quickly as possible



# Motionbuilder



Lock down your animation templates as early as possible

Spend time on helpful constraints and pose libraries to improve animation workflows

Create 'How to' documentation for onboarding new animators

Review key and technically difficult animations with someone who has expert knowledge in the field

Work on a water-tight save and back up system and ensure everyone follows it



# Embracing External Development



## Working with Submission Mo-cap: Clean up & Motion Accuracy.

### General guidelines.

1. Always, refer to video reference provided:

-look at video reference and compare to animation data, identify major and minor differences

-if possible find Secondary video reference on Youtube. (This can be very helpful for explaining step by step, how and why each major movement is preformed, valuable for context.)

-if a motion or the purpose of a movement is unclear during, check video reference

2. Animate fingers with hand poses, as simply as possible. Pose to pose.

-Additional changes will be made to the animation in EA studio, clean poses, are best to do after all the main animation is final and complete.

3. Minor penetration is okay.

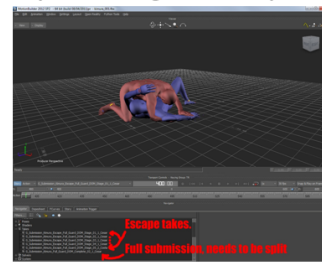
-Due to rig design and complexity of the moves, the 2 characters WILL penetrate, reduce as much as possible, but not so much that original purpose of move is lost.

4. Use constraints, carefully

-Idles are a good time to use a constraint.(Usually) If a piece of animation needs to loop, and a hand is grabbing a body part, then usually constraining that hand will reduce the obvious look cycling appearance of a loop.

-Careful to not constrain a hand, thereby losing unique animation during transitions and escapes. If the hand is clearly holding a body part or an extended period of time, constraints are fine. This will ensure we retain intricate movements, and retain as much authenticity as possible.

### Steps to working with mo-cap.



1. Split up main submission take into pieces. using story tool)

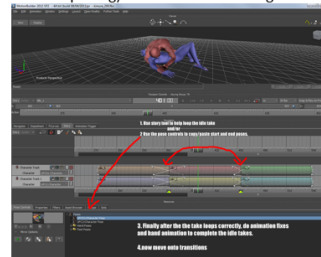
And plot into new takes named as such:

(In most cases WE WILL SPLIT UP THE MAIN ANIMATION INTO THE BELOW TAKES FOR YOU!)

1. Attempt
2. Attempt Idle

3. Attempt deny
4. Transition 1
5. Idle 1
6. Transition 2
7. Idle 2
8. Transition 3
9. Idle 3
10. Transition4
11. Idle 4
12. Transition 5
13. Idle 5
14. End

2. Edit all "Idle" takes and animate to loop smoothly, reducing the look of a cycling animation as much as possible. (Using copy and paste, start/end posing) and other smoothing tech



3. Copy and paste the start/end poses from the now "Looping Idles" on applicable start OR End pose of the other takes.

Eg. -From "Idle 1 looping" =copy the start/end pose (which is the same pose) onto the:

-start of transition 2 (which transitions from idle 1 to 2)

Logged November 7th 2013		
FBX Take name	Status	Complete
<b>ufc_pres_octagon_entrance_entourage_blue_SetB_pack_all</b>		
13003_1_NIS_octagon_entrance_entourage_blue_corner_medium_slow_01	Approved Nov 7th	Approved
13004_1_NIS_octagon_entrance_entourage_blue_corner_medium_fast_01	Approved Nov 7th	Approved
<b>ufc_pres_octagon_entrance_entourage_red_SetB_pack_all</b>		
13009_1_NIS_octagon_entrance_entourage_red_corner_medium_slow_01	Approved Nov 7th	Approved
13010_1_NIS_octagon_entrance_entourage_red_corner_medium_fast_01	Approved Nov 7th	Approved
<b>ufc_pres_ref_breakfight_SetA_pack_all</b>		
13026_1_NIS_referee_break_fight_ground_referee_fighters	Approved Nov 7th	Approved
13026_2_NIS_referee_break_fight_ground_referee_fighters	Approved Nov 7th	Approved
13026_3_NIS_referee_break_fight_ground_referee_fighters	Approved Nov 7th	Approved
13026_4_NIS_referee_break_fight_ground_referee_fighters	Approved Nov 7th	Approved
13026_5_NIS_referee_break_fight_ground_referee_fighters	Approved Nov 7th	Approved
13026_6_NIS_referee_break_fight_ground_referee_fighters	Approved Nov 7th	Approved
<b>ufc_pres_ref_breakfight_SetB_pack_all</b>		
13027_1_NIS_referee_stop_fight_submission_referee_fighters	Approved Nov 7th	Approved
13027_2_NIS_referee_stop_fight_submission_referee_fighters	Approved Nov 7th	Approved
13027_3_NIS_referee_stop_fight_submission_referee_fighters	Approved Nov 7th	Approved



Plan your budget and workload early and begin investigating vendors as soon as you can

Prepare examples of animations and workflow documentation for all the types of animations you intend on sending out

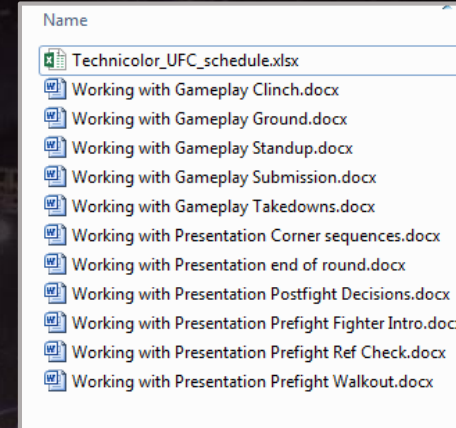
Trust your vendor's recommendations on workflows and review processes. Agree on a sign-off system

Send them as much reference material (and swag!) as you possibly can



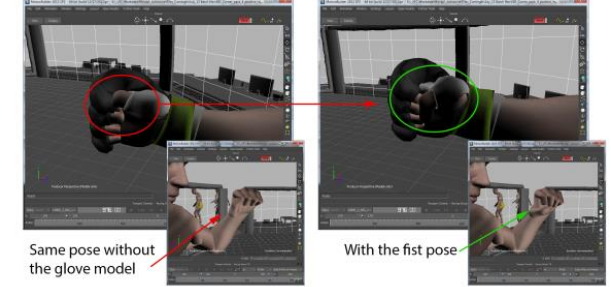


# Embracing External Development



14006\_2\_NIS\_corner\_positive\_injured\_02\_withHands

Please make use of the fist pose provided in the scene file and make sure that the thumb is visible outside the fingers. The pose that you have provided does not look correct, and this would get exposed if the camera were to be an upclose shot.



Visit their studio if there are technically challenging workflows that require hands on training

Remember to set aside a lot of time for preparing work to send out and also for reviewing when you receive it back

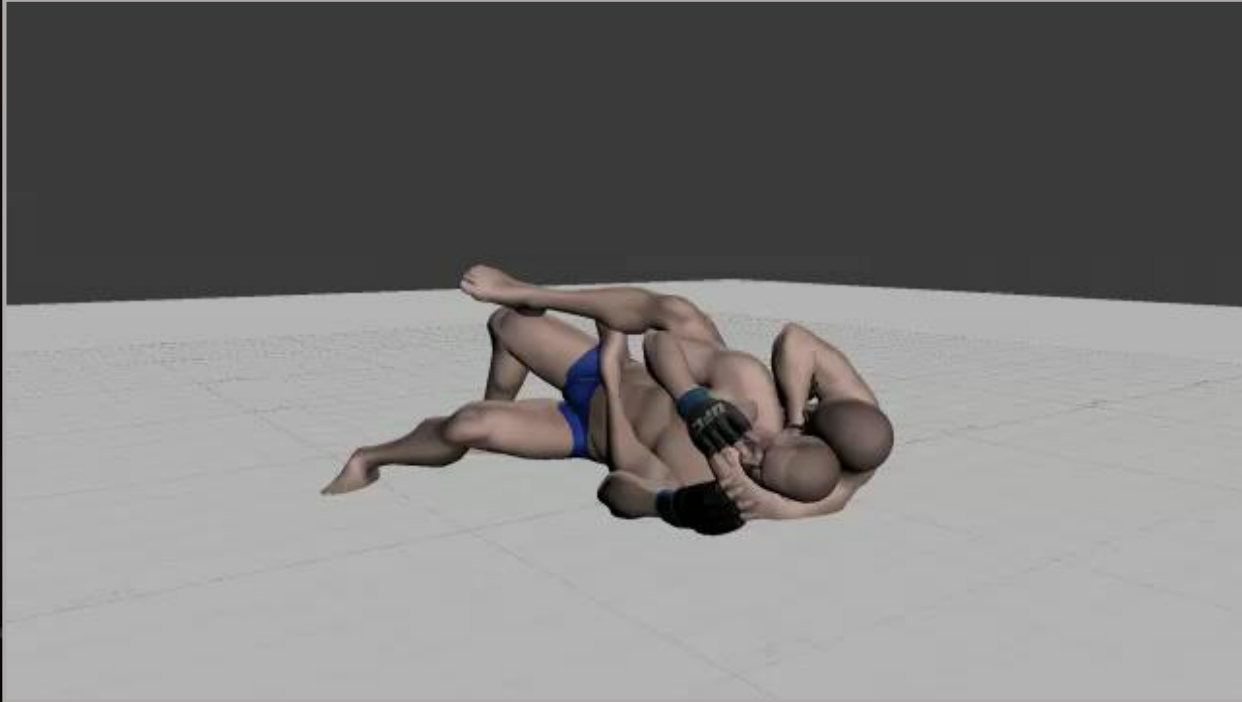
Be constructively critical when you need to and praise as much as you can

Think of the vendor as part of your own animation team. Try to build a long term relationship with them and enjoy the experience

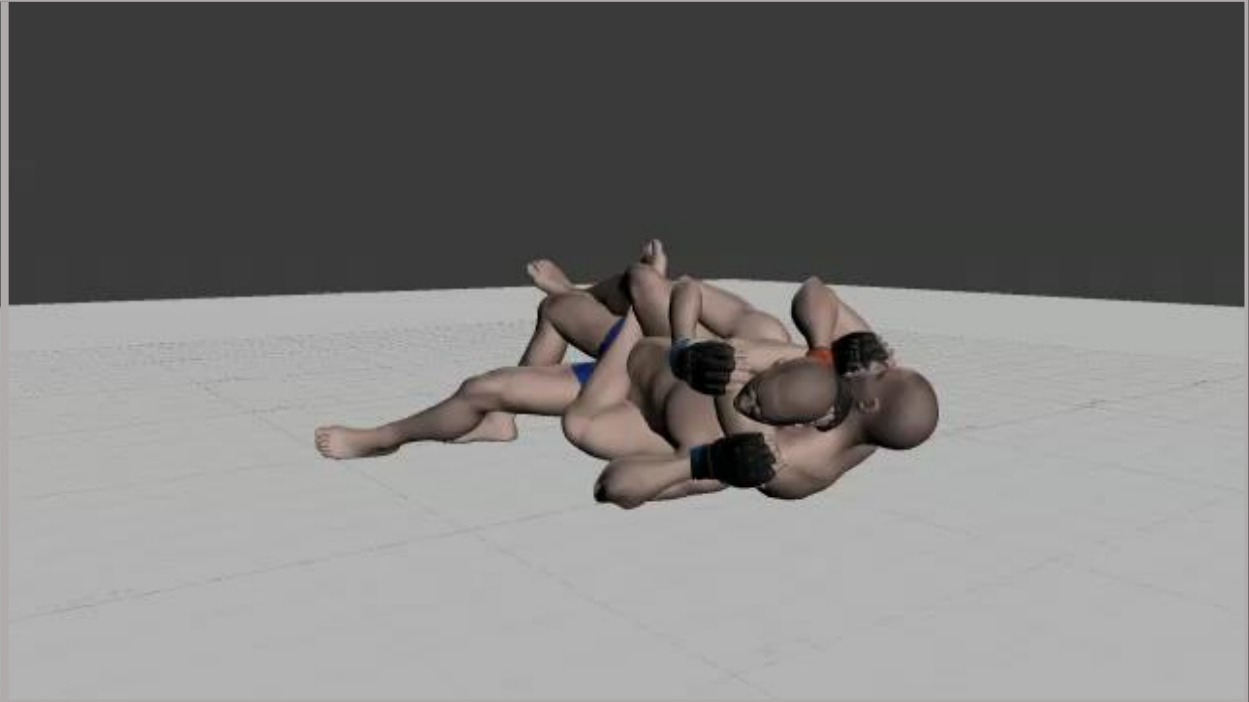
We sent 3000 man days of work to Technicolor (roughly 60% of all our gameplay and 80% of all our presentation animation)



# Rear Naked Choke – Finish tap out animation



Raw mocap



After Technicolor clean up



# Animation Toolkit (ANT) workflow



Build a Sequence,  
add Branch  
Windows and Tags



add Sequence to  
Relative IK  
Controller



Add Relative IK  
Controller to  
Character  
Interaction Master  
Controller



Add Character  
Interaction Master  
Controller into  
Stateflow



Jon Jones



Alexander Gustafsson

**UFC** 2:55 RD 1



# UFC Locomotion

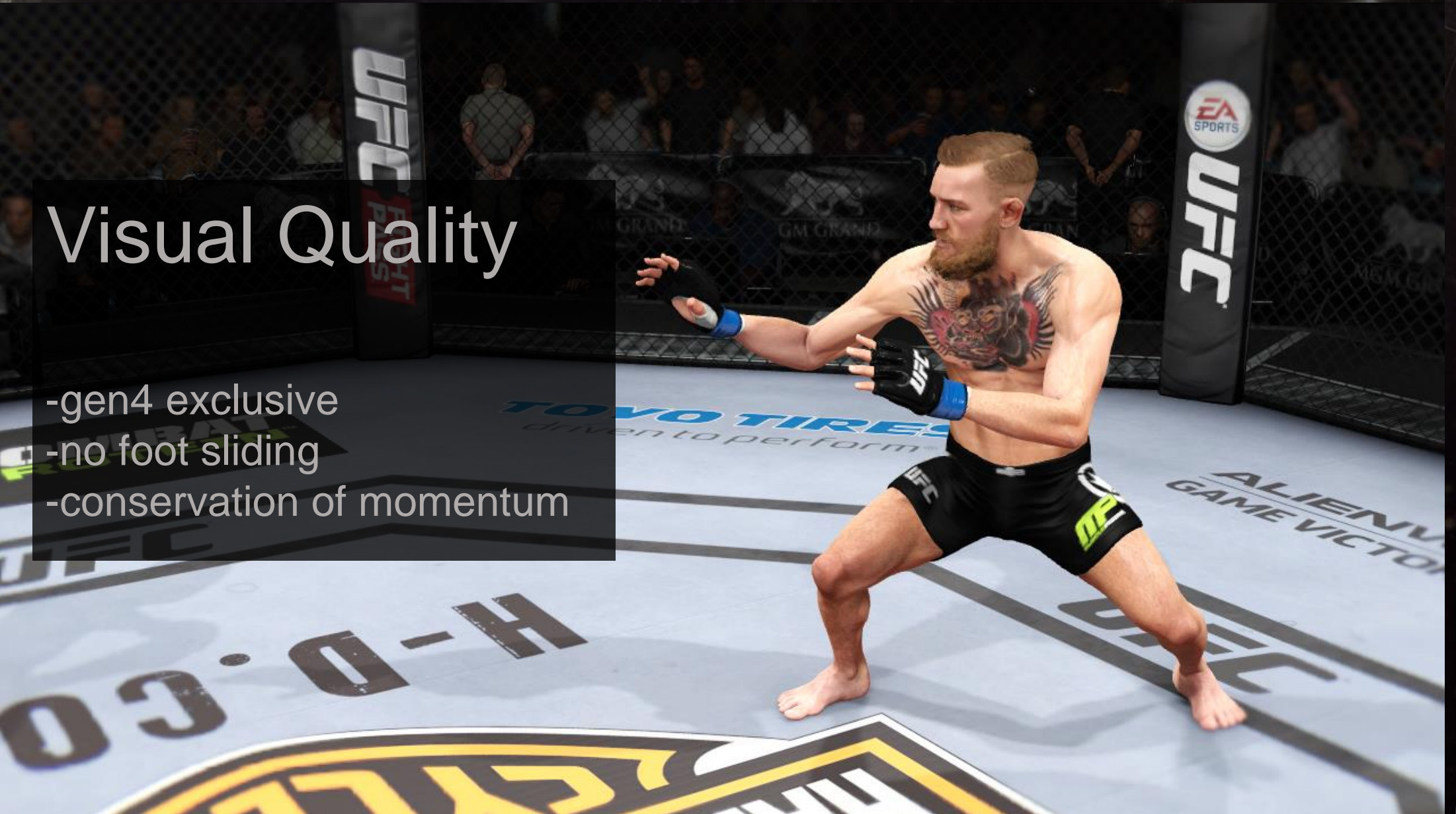




# UFC Locomotion

## Visual Quality

- gen4 exclusive
- no foot sliding
- conservation of momentum





# UFC Locomotion



## Responsiveness

- immersion
- twitch game
- competitive game



# UFC Locomotion



## Variety

- roster of over 100 fighters
- unique look for each
- authenticity critical



# UFC Locomotion



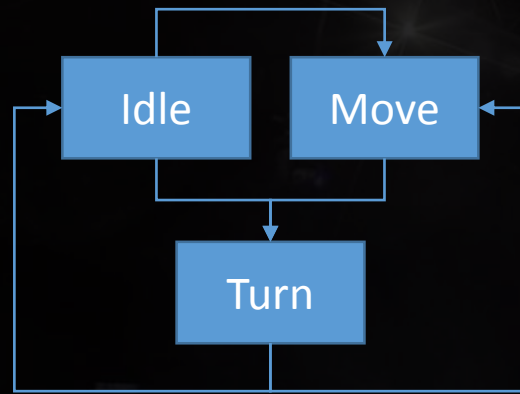
## Procedural Solutions

- deal with variety requirements
- responsive
- visual quality?



# UFC Locomotion

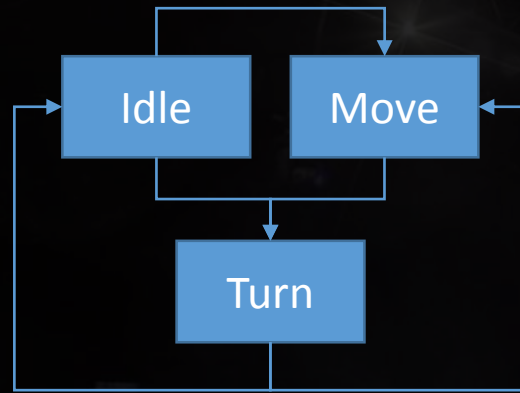
## Movement State Machine





# UFC Locomotion

## Movement State Machine



## Functional

- basic movement
- change of direction turns
- lunges

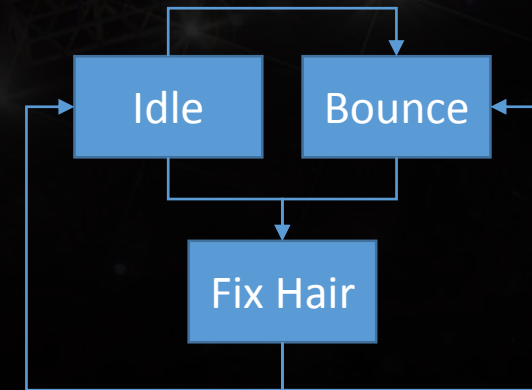
## Animations

- short animations
- large functional coverage
- small aesthetic coverage



# UFC Locomotion

## Idle State Machine





# UFC Locomotion

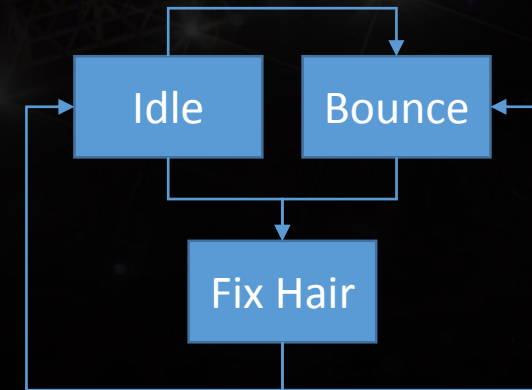
## Aesthetic

- personality
- emotion
- narrative

## Animations

- small functional coverage
- massive aesthetic coverage
- very long animations

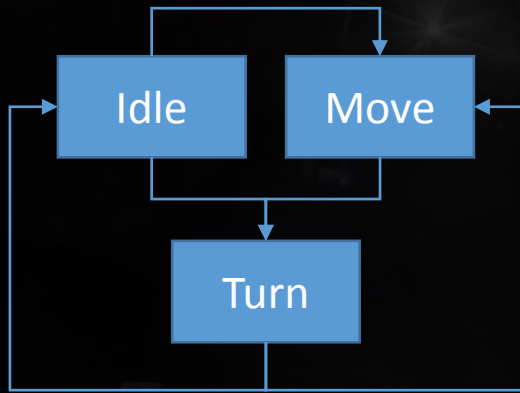
### Idle State Machine



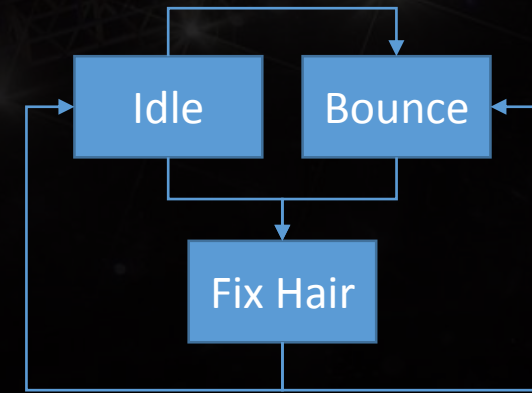


# UFC Locomotion

## Movement State Machine



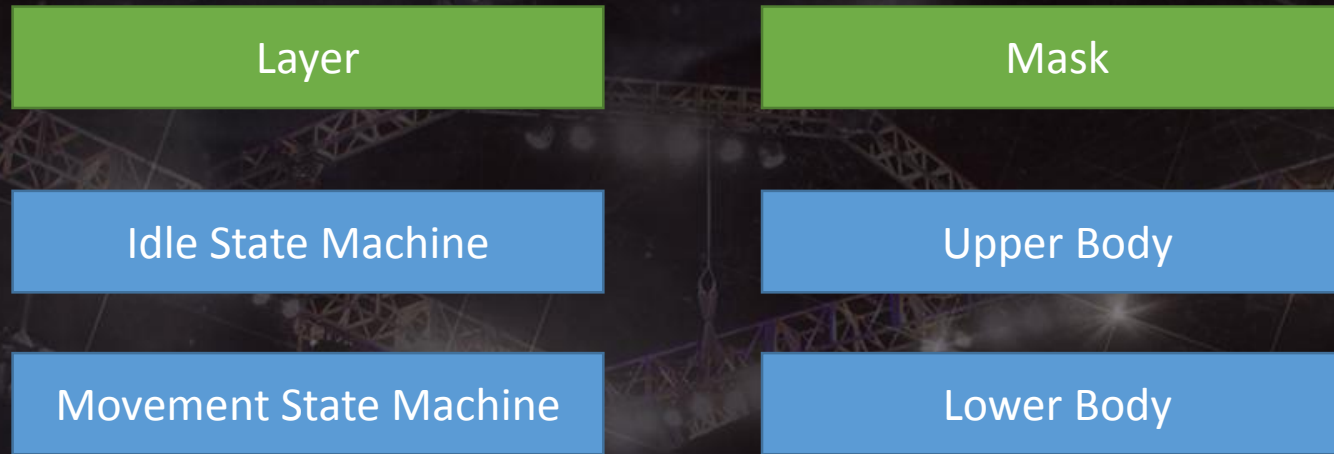
## Idle State Machine



Procedurally combine these two systems to achieve the best of both.



# UFC Locomotion



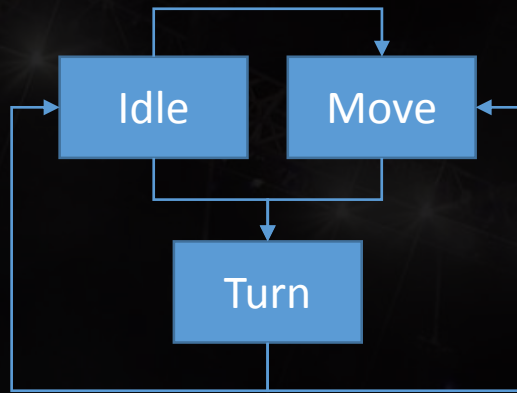
- Looked Stiff and disconnected
  - some lower body animations needed upper body movement
  - some upper body animations needed lower body movement
  - some needed to be full body animations



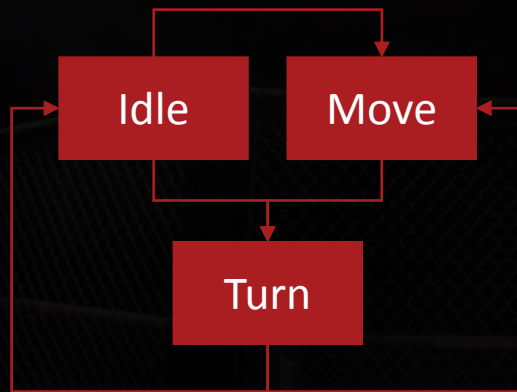
# UFC Locomotion

## Movement State Machine

Regular



Additive



- Identical state machines aside from the animations inside them

- driven by the same game logic

- guaranteed to transition in lock step due to determinism of simulation



# UFC Locomotion

Layer

Mask

Idle State Machine

Variable

Movement State Machine  
Regular

Variable

Movement State Machine  
Additive

Variable



# UFC Locomotion

Layer	Mask
Idle State Machine	Variable
Movement State Machine Regular	Variable
Movement State Machine Additive	Variable



Procedural Foot Planting

# UFC Locomotion

Layer	Mask
Idle State Machine	Variable
Movement State Machine Regular	Variable
Movement State Machine Additive	Variable
Procedural Foot planting	



Procedural Head Tracking



# UFC Locomotion

Layer	Mask
Idle State Machine	Variable
Movement State Machine Regular	Variable
Movement State Machine Additive	Variable
Procedural Foot planting	
Procedural Head Tracking	



Procedural Toe Splay

# UFC Locomotion

Layer	Mask
Idle State Machine	Variable
Movement State Machine Regular	Variable
Movement State Machine Additive	Variable
Procedural Foot planting	
Procedural Head Tracking	
Procedural Toe Splay	



Procedural Cage Square Up



# UFC Locomotion

Layer	Mask
Idle State Machine	Variable
Movement State Machine Regular	Variable
Movement State Machine Additive	Variable
Procedural Foot planting	
Procedural Head Tracking	
Procedural Toe Splay	
Procedural Cage Square Up	
Procedural Turning	



# UFC Locomotion

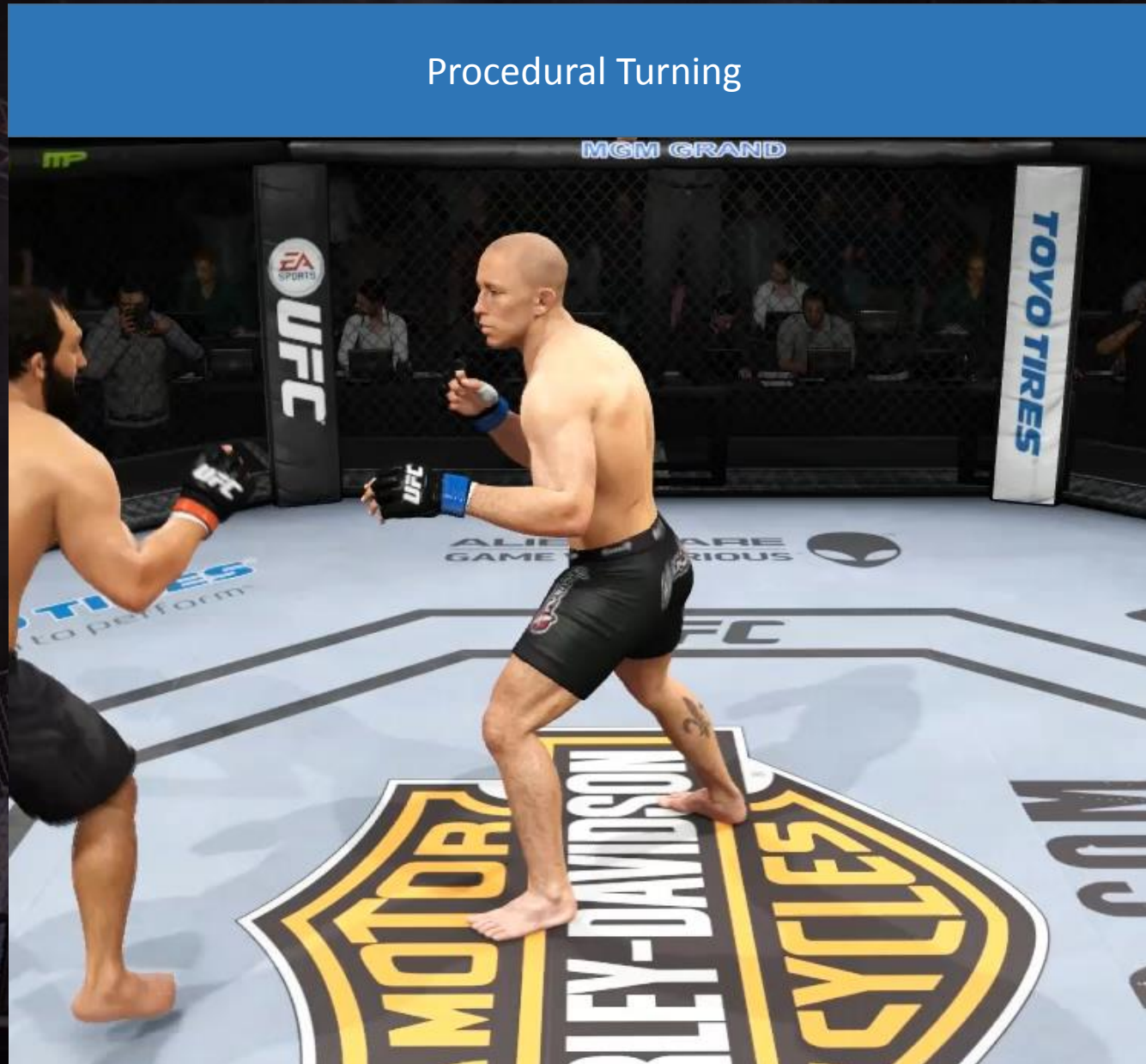
Procedural Turning





# UFC Locomotion

Procedural Turning



# UFC Locomotion

Procedural Turning





# UFC Locomotion

Procedural Turning



# UFC Locomotion

Procedural Turning





# UFC Locomotion

Procedural Turning



# UFC Locomotion

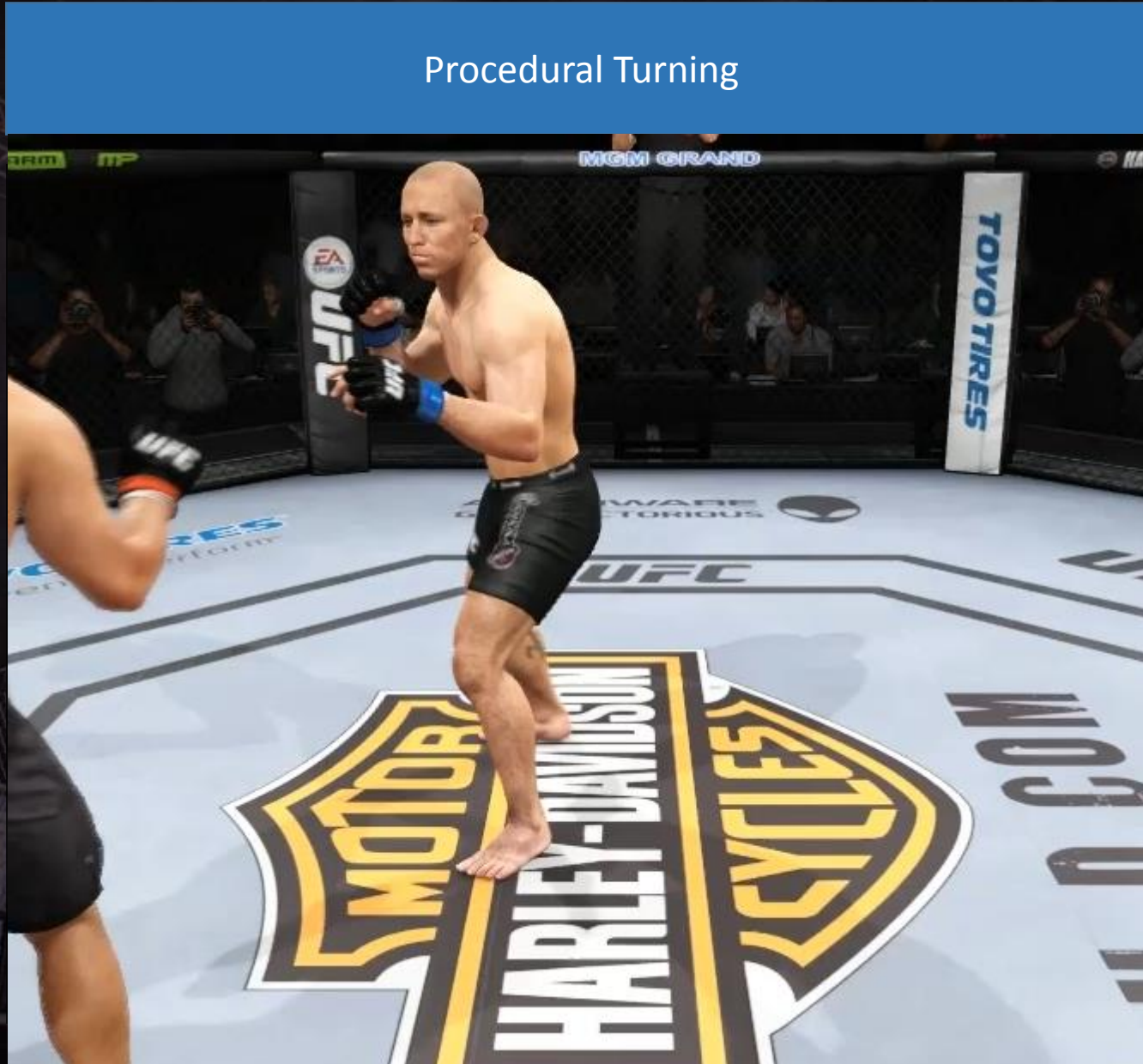
Procedural Turning





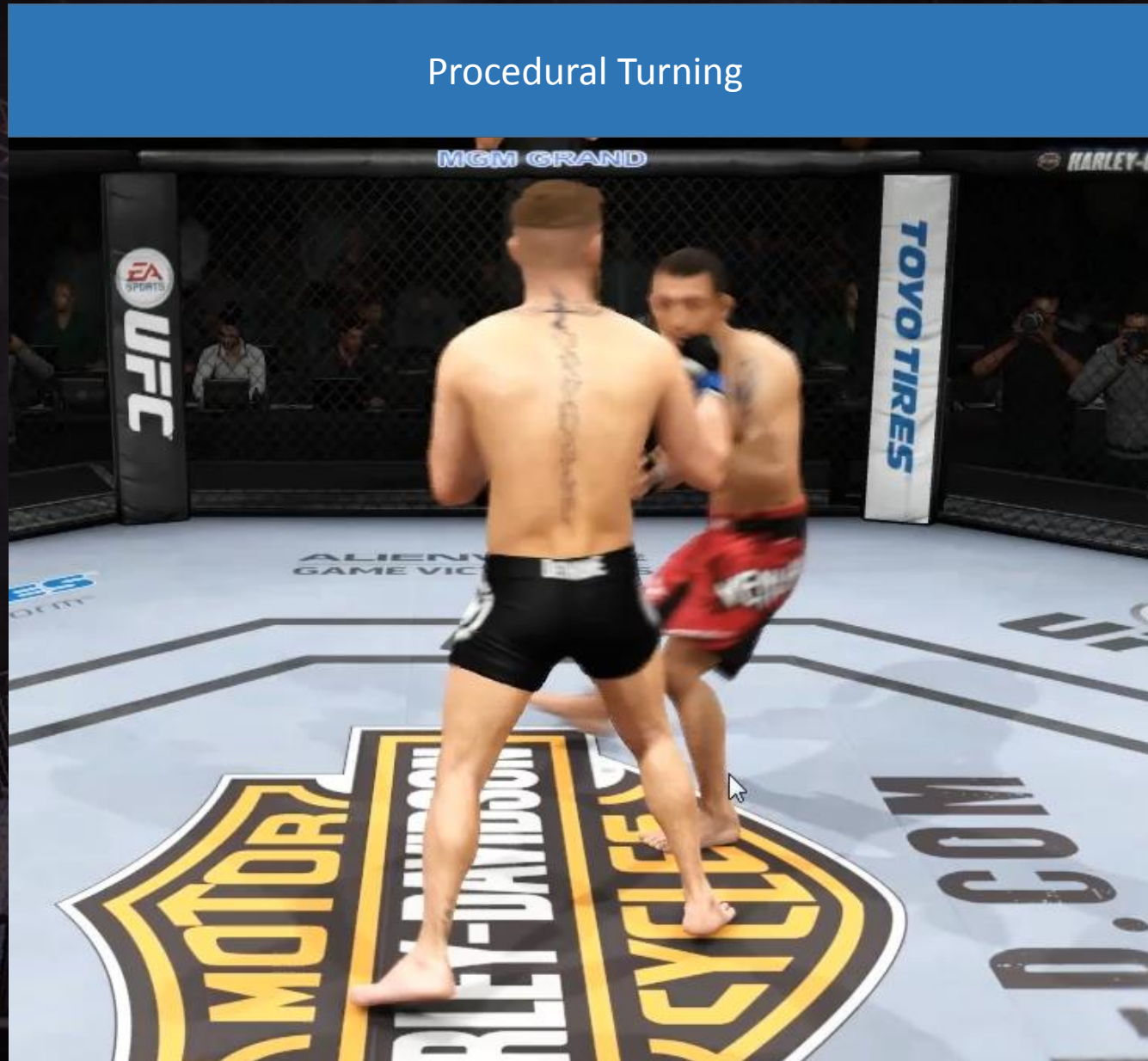
# UFC Locomotion

Procedural Turning



# UFC Locomotion

Procedural Turning





# UFC Locomotion

Procedural Turning





# Still a long way to go to get things right...

Hands had very rudimentary collision volumes. Lots of floating and sinking fingers



Our “soft body physics” was a brute force tagging process propped up by some vertex shaders on the rendering side



Cloth simulation didn't work well on the ground game



Physics fought with IK, and we put in a last minute hack fix that required additional tagging of physics “grabs”. Another solution that didn't scale well at all







# **GOLDIE AND JOE COMMENTATE EA UFC GLITCHES**

Shawn Reardon

# Workflow Improvements for UFC 2

We have our first game shipped, so we have an audience to draw feedback from

Our ExDev team are responsible for 100% of the animation cleanup

Automating Relative IK

Automating Trajectory animation during Clinch and Submission features

Move the IK system into the physics engine

Simplify workflows for adding animation content to the game

Unify clinch, ground and takedown systems under one design and implementation

Validate design before going wide with content

Turn off physics during transitions by default, turn it on per limb as needed

Enforce naming conventions!





Questions?