



NEXT IN



A <Global Hackathon> challenging you to enhance the digital cricket fan experience



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HACK 2 SKILL

Generation VR

Putting the fan in the game !

A hybrid 'Watch-and-Play' experience in VR. Connect with new fans through innovative, interactive experiences

Through **VR**, fans could watch a bowler bowl any delivery in a match, and then see if they could **play** that delivery better than the actual batter.

Our advanced **multi-player motion tracking system** acts as a data source for VR. It creates **life-like accurate 3D representations of the bowler** and ball, which are uploaded to our **VR game for fans to play** against.

This technology would be the **first of its kind** in offering fans the chance to experience just how good international bowlers are, how fast they bowl, how much they spin it, how difficult it is to pick a bowlers' variations and how hard it is to hit a 6.

Imagine being in the World Cup final, six balls left, 11 runs to win, Jasprit Bumrah running in to bowl. Could you do it, could you score the winning runs? No longer do you have to imagine, you could actually be there. Have you got what it takes to win the World Cup!

Fans the world over have always debated how difficult it is to execute at the highest level under the ultimate pressure. *“This guy is useless, how could he miss that, I could do better.”* Now we can actually put the fan into the game and see if they could do better.

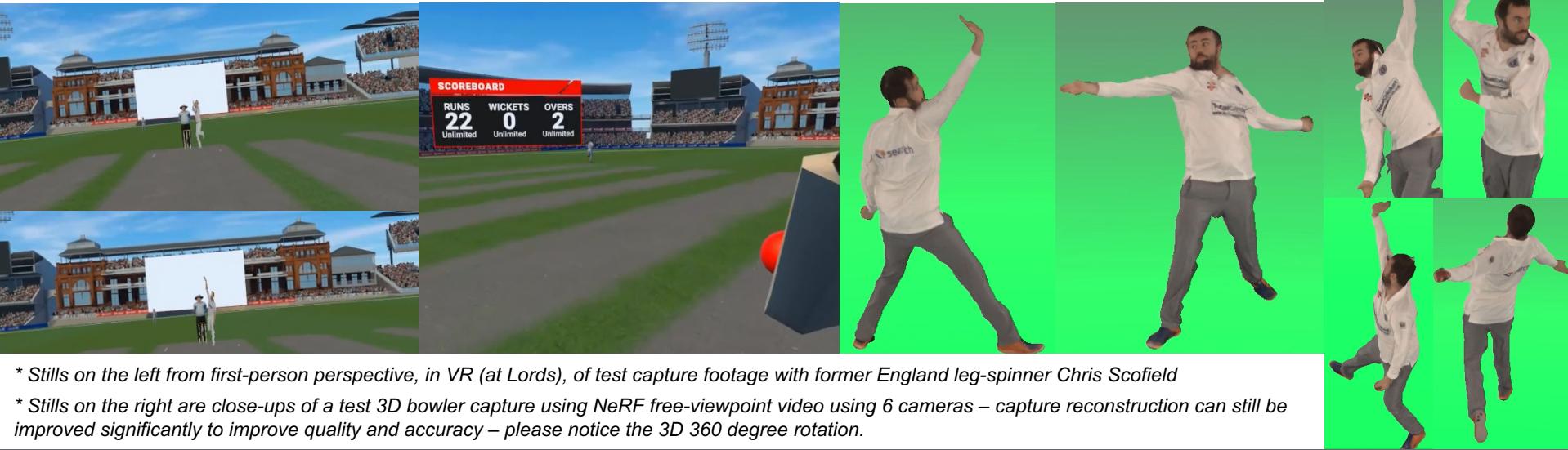
Existing VR experiences are nothing more than arcade games, they lack the visual quality, they use manually created animations for bowler actions. These lack the complexity and intricacy of real bowlers' movements, and the only way of previously capturing bowling actions would be for them to wear a motion capture suit in a lab, but those captures can never replicate the intensity and adrenaline of performances during a live match.

Our technology solves this problem. Our markerless system can be setup at stadiums to capture player movements to the finest degree, including hand and finger tracking. Any delivery bowled during the match is captured, and via our plugin, can be replayed in virtual reality to fans at home, anywhere around the world.

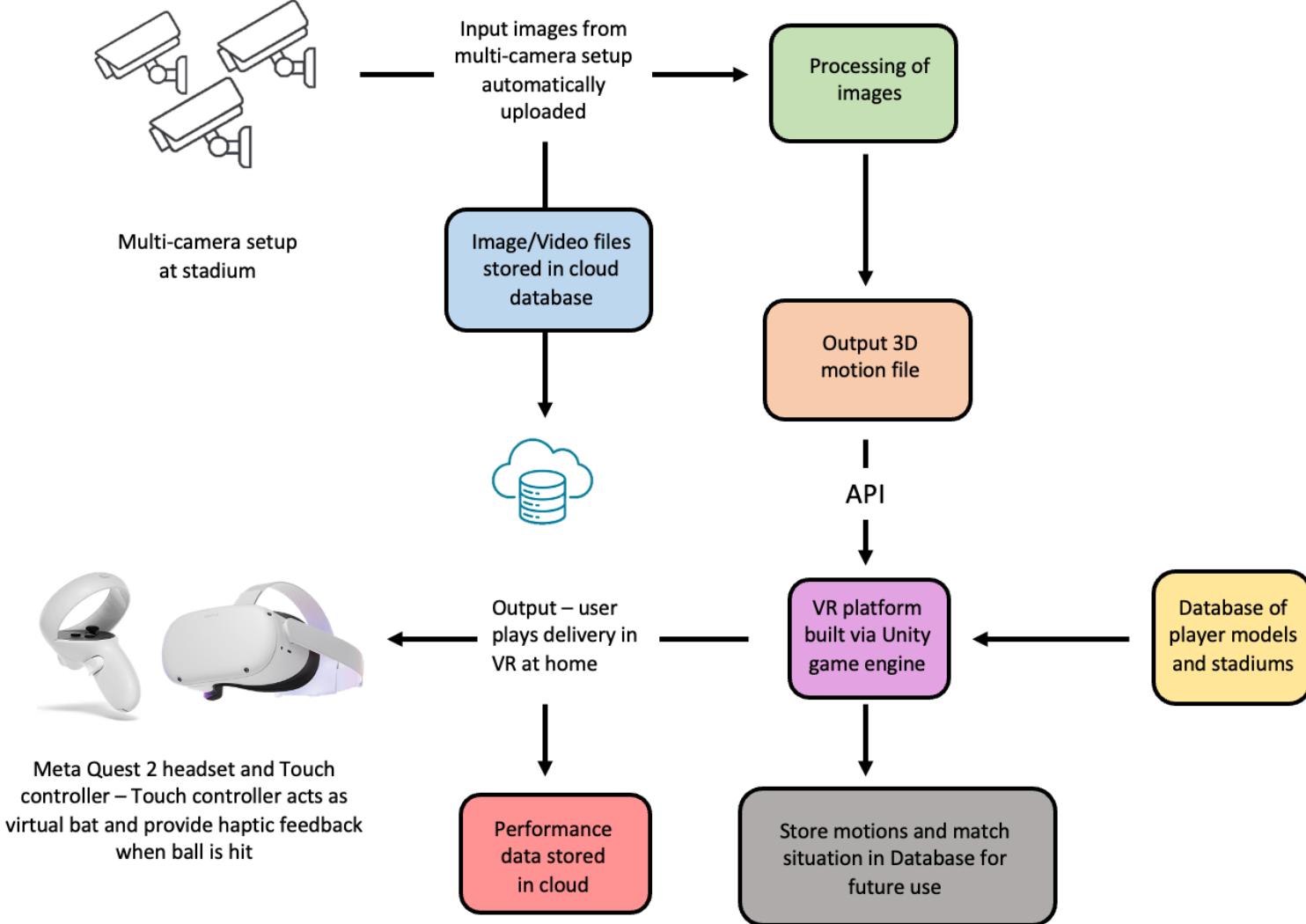
To note, the reason Hawk-eye data ball data can't be used alone is because the bowler's action is as important in identifying length correctly as the ball trajectory. It is the subtle cues in it that give a batter a head start on the ball length. This is the reason multi-camera capture systems are required. Skeletal tracking from a single camera or using an unrelated animation would result in significant inaccuracies and would make playing the delivery in VR harder than it already is.

Features offered :

- Integration of performance **captures into VR** allows fans to virtually play against any bowler or ball bowled during the World Cup or any other ICC match
- Additional integration of 3D captures **into the ICC's existing ecosystem** of apps – mobile AR, Cricitos etc.
- Data capture on fan's/user's performance could present **new competitions and engagement opportunities** as a full scoring system is in place
- **Competitions throughout the World Cup** – fantasy competitions with prize rewards – most runs scored throughout, most 6s hit, biggest 6, highest score before a dismissal, most runs in an over
- Upload videos to social media to win **Fans 'Play of the day' – vote for best shot**
- **Social play & multi-player** – Create leagues and challenge friends to see who can score the most runs against a particular bowler or team! Or even **build a team of bowlers** from around the world to play with.
- **Adjust difficulty levels** to suit younger ages by slowing down ball speeds and add bat boosts to allow them to **hit the ball easier** and further.



Process Flow Diagram:



Business Logic of the solution :

Our interactive ‘Watch-and-Play’ experience brings fans into the game either as it takes place or after the match has finished.

- Engages the younger generation who are moving away from the TV viewing experience and towards more interactive media formats.
- Connect with new audiences by immersing them in competitive sport as it happens.

This could either be used as in-stadium entertainment experiences, at fan parks, or at home through someone’s personal VR headset:

- In-stadium and fan park experiences could be enhanced through features enabling multiple players to play together – so more complex aspects of the game, such as running between the wickets, could be incorporated
 - or through the use of haptic technology within a 3D printed cricket bat
- Personal VR system would use either just the motion controller or a motion controller integrated into a 3D printed cricket bat – both options are supported already

Markerless motion capture and mesh tracking built via custom computer vision algorithms

API connects our player tracking software to our virtual reality platform/game (built in Unity) so fans can experience what it is like to play international cricket through their VR headset at home

Programming languages used – Python, C++, C#

Meta Quest 2 headset and Touch motion controller – Touch controller can either be inserted into a 3D printed bat/bat handle or used on its own to control bat movement – haptic feedback through vibrations when the virtual ball is hit.

There are two options for the camera capture setup.

Option 1:

Dedicated 12-camera multi-camera system – setup at stadiums with cameras all focused on the pitch (6 cameras at either end – capturing full bowler run-ups as well).

Cameras are all time-synced and have a minimum framerate requirement of 120 frames/second to meet VR standards, otherwise playback in VR looks like sequence of still images rather than video.

This setup is designed to be moved from stadium to stadium very easily (<1 hour setup & calibration). As such, multiple camera systems wouldn't be needed for each stadium.

Option 2:

Skeletal tracking via existing Broadcast cameras – there are a number of pre-requisites (in order of importance):

- For accurate 3D motion capture, a **minimum of 3 cameras** are needed to see the target object (in this case, each joint) at every frame.
- Cameras **fixed in position** and not rotating to follow the ball/play - this would throw off tracking algorithms.
- **Time synchronisation** of camera feeds – this could be done using an audio spike such as bat/ball collision, which we have already solved using GoPro's as part of a golf skeletal tracking project. Or via a visual cue – ball release, front foot contact
- Frame-rates – minimum requirements for playback in VR is about 90 fps, otherwise it is visually distracting. Most broadcast cameras shoot at 24-30fps so additional frames would need to be “created”. This could be done via **frame interpolation**. We would process the 30fps footage to produce a 3D skeleton, then via AI add new frames between the existing ones.

If all in place, then it's possible to integrate an accurate skeletal tracking solution and combine it with Hawk-eye trajectory data for use in VR, without a loss in quality or accuracy to the end-user.

The advantage of this method is, if there are multiple feeds of historical footage in storage, then these could be used to recreate classic deliveries for fans to play against as well. An obvious example would be recreating the Super Over from the 2019 final.

Estimated cost of/after implementing the stadium capture solution :

£2,500/game (subject to exchange rates) plus travel and accommodation-related expenses

Cost covers staff to:

- Setup and calibrate camera system at stadium
- Operate system and monitor performance

Cost to the fan/consumer/end-user:

Dependent on the ICC, no issue with it being a free-to-play VR app

Future use cases :

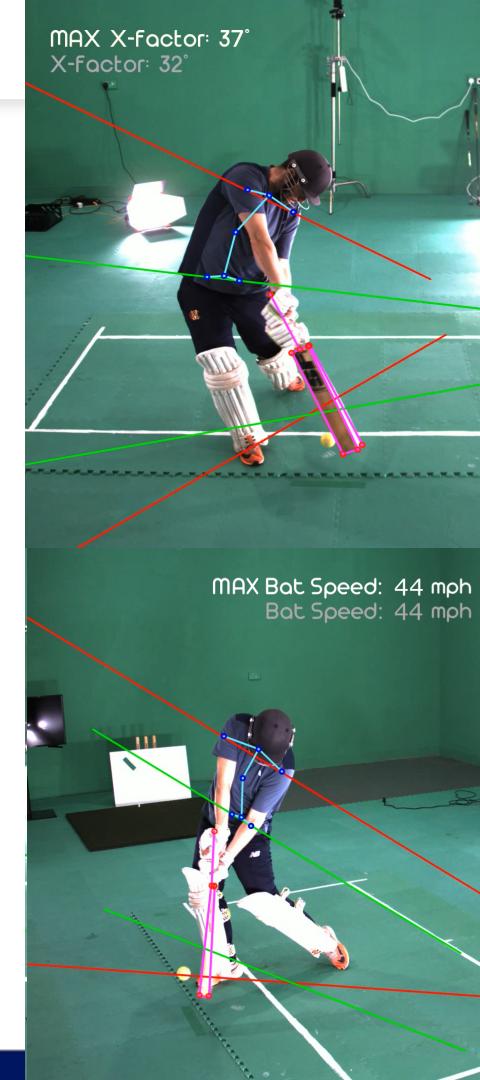
Fully licensed ICC Cricket VR game

Broadcast enhancement – for example, analysis of different batter's power hitting techniques (X-factor and Bat speed shown opposite – studies show X-factor (difference between shoulders and hip angles in the transverse plane) is the single biggest predictor of power hitting distance)

New viewing angles – both broadcast or via immersive media – example, from 1st slip's vantage point

NFT's in the form of player motions – 3D recreations of iconic deliveries and shots

Integration into metaverse applications, Roblox etc.





Thank you

