DRAFT 05-01-2023

Pitcherview

Pennantview Application #1

“On The Mound”

James O’Flanagan

May, 2023

Rev. 0

Summary

- Summary
- Intellectual Property, Patent Pendency, Confidentiality
- Definitions
- Mission Statement
- Analysis Software & CFD
- Methodology
- Use Case #1

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Patent Pending

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Alexandria, VA 22313 - 1450
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
63/476,206	12/20/2022 12:07:03 PM ET	0002

Title of Invention

Pennantview - A Computational Method for Determining Baseball Biophysical Quantities

Application Information

APPLICATION TYPE	Utility - Provisional Application under 35 USC 111(b)	PATENT #	-
CONFIRMATION #	4953	FILED BY	James O'Flanagan
PATENT CENTER #	61326298	FILING DATE	-
CUSTOMER #	–	FIRST NAMED INVENTOR	James Emmett O'Flanagan
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Documents **TOTAL DOCUMENTS: 4**

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
ADS-Pennantview-PDF-JEO-12202022.pdf	4	Application Data Sheet	838 KB
Warning: This is not a USPTO supplied ADS fillable form. Data in the form cannot be automatically loaded to other USPTO systems.			
Pennantview-sb0016-CoverSheet-JEO-12202022.pdf	3	Provisional Cover Sheet (SB16)	227 KB
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Pennantview-PTO2038-payment-JEO-12202022.pdf	3	Fee Worksheet (SB06)	242 KB
Pennantview-ProvPatentApp-JEO-12202022.pdf	82	Specification	9521 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an

international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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Definitions

- ***FEA*** is Finite Element Analysis. FEA was developed in the 1970s as a distinct mathematical and computational discipline. FEA uses Newton's three laws of motion and applies them to a finite discretized geometry like a human body (as opposed to a continuum).
- ***Rigid Body Motion*** is the consideration
- ***CFD*** is computational fluid dynamics
- Ray Tracing
- ***Continuum Mechanics***: a;lsdjfa;ldskjf;asdkljf
- ***Composite Mechanics***: adsfljad;lkfj
- ***Computational Mechanics*** is the application of first principals physics to an engineering problem using high performance computing techniques.
- ***Full Spectrum Mechanics*** – Taking into account translation, rotation AND deformation in solving a mechanical system. An objects' flight can be affected by the deformation it undergoes while in flight.
- Rigid Body Motion
- ***RT*** – Abbreviation for Real Time. Refers to the goal of producing a computational package that is able to help influence baseball strategy in real time.
- ***Constitutive Model*** – A set of mathematical equations that describe an objects motion and materials

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Definitions

- ***Biophysics*** – Interdisciplinary science that applies approaches and methods traditionally used in physics to study biological phenomena
- ***Software Application*** – A software program that examines a specific physical phenomenon
- ***Software Suite*** – A grouping of Software Applications that accomplish baseball goals
- ***First Principals*** – A basic assumption that cannot be deduced any further
- ***Big Data*** – Data sets that are too large or complex to be dealt with by traditional data-processing application software
- ***Newtonian Mechanics*** – Mechanical systems that behave according to Newton's three laws of motion
- ***Computation Fluid Dynamics (CFD)*** – High Performance computing techniques that use the Navier-Stokes equations to describe fluid flow systems, and their interaction with other matter.
- ***Functional Variation*** – An applicable use case of the methodology in question

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Pennantview

Pitching

Pitcherview
Analyzes the acceleration of a pitcher to predict pitching power

Hurlerview
Analyzes the pitcher himself, his anatomy, his ability to throw

In the Field

Runnerview
Analyzes baserunners, to optimize path and prevent injury

Throwerview
Analyzes position players' throwing motion, to optimize

Batter's Box

Batterview
Analyzes the person who is batting, his anatomy, his ability to hit

Hitterview
Analyzes the acceleration of a batter to predict hitting power

Grounds

Ballparkview
Analyzes stadiums and weather to predict flight of fly ball

Batterseyeview
Uses ray tracing with FEA model to determine Batter's eye viewing quality

Saberview Data Layer

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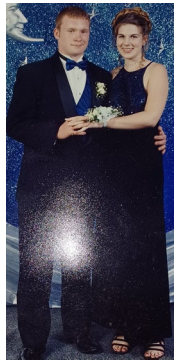
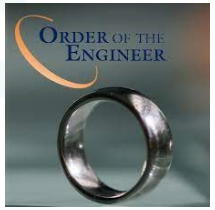
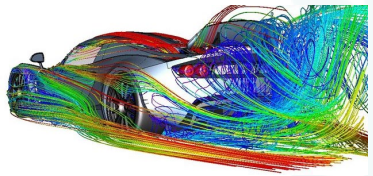
Jim's Background

- Wife is Becca; kids Azra & Elijah; dogs Buffy & Bones



- Computational Mechanics Expert





- Case & John Carroll (football) for BS, Akron U. for MS.

JOHN CARROLL UNIVERSITY

CASE WESTERN RESERVE UNIVERSITY
think beyond the possible

THE UNIVERSITY OF AKRON 1870

- Degrees in computer, mechanical, and management engineering

- 22 years engineering experience in biotech, oil & gas, tires, automotive, nuclear, national defense, shipping, and rail.

Johnson Matthey
Inspiring science.

B&W BABCOCK & WILCOX

AceVision See Life Naturally

GOODYEAR

HANKOOK

- FEA, CFD, Rigid Body Animation, Numerical Methods

Ansys

M AYA

SIMULIA ABAQUS

- Born in Akron, Ohio; Raised in Boston Heights;

OHIO AKRON

COMMUNITY · SCHOLARSHIP · DIVERSITY
WOODRIDGE

- Graduated from Woodridge High School in 1998, my wife following in 1999

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Science & Baseball

History

- 150 years ago, Henry Chadwick invented the box score for player stats
- 50 years ago, Bill James popularized probabilistic & statistical analysis of baseball
- 25 years ago, small market teams were able to gain an edge using superior market information from statistical analysis to make better player personnel decisions than the Yankees (Beane, Shapiro, Epstein, et. Al)

Observations

- This was the result of a great many finance majors applying statistical concepts like equity volatility to valuing baseball players, like Bill James did before them (Paul Depodesta being an example)
- Teams like Cleveland, Oakland and Houston embraced data analysis as a legitimate tool for building teams and putting prices on player transactions.
- Resulting from this was a "***corner***" on the market for things like On Base Percentage and Slugging because other, big market teams did not value them as highly.
- In 2023 the statistical field is level in MLB. All 30 teams employ advanced sabermetric analysis

What is going to provide the next edge for a small market team?

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Why Bio-Physics, FEA, CFD, and Pitcherview?

- MLB has experienced a large mean reversion in the market for baseball player information
- Because ***Pitcherview*** uses physics and not statistics, it can make predictions about future events while knowing much less about the past
- Because all 30 MLB teams now employ highly qualified R&D staffs, there is no information advantage for the small market teams in contracts, player evaluation, and game strategy
- In order to re-gain the competitive advantage over the Yankees, small market teams must take the technological lead once again.
- ***Biomechanics*** & ***Computation*** are the way!
- By incorporating baseball ***biophysics*** software into their current player evaluation processes, teams can make more accurate player judgements and decisions on player contracts.
- This allows for more efficient use of teams' capital, decreasing the chances of a bad draft pick or free agent signing
- In conjunction with current statistical analysis methods, ANY small market team could stand to benefit from this.
- Same too with college, high school, pee-wee, and rec league baseball teams

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Pitcherview

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Pitcherview Mission Statement

- "To apply full spectrum kinematics & computational mechanics to the baseball pitching motion to better aid in the evaluation of players and baseball techniques."

Full Spectrum Kinematics

A technique for solving mechanical systems that takes into account translation, rotation AND deformation.

+

Computational Mechanics

The application of first principals physics to an engineering problem using high performance computing techniques.

+

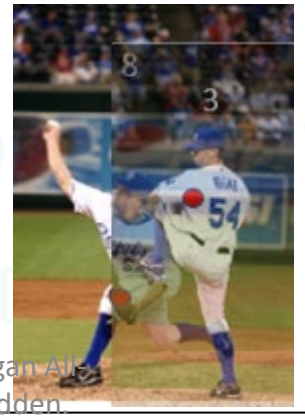
Software

- What software is applicable?
  - Finite Element Analysis (Translation, Deformation)
  - ANSYS, Abaqus, COMSOL, NASTRAN
- Bespoke software
- Rigid Body Motion (Translation Only)
  - Maya, Renderman, etc.

+

Baseball Pitching Motion

The standard baseball delivery; from the set position to ball release



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Baseball Techniques

Any skilled baseball motion, like a hitter's swing or a pitcher's pitch; any sub-motion of those main baseball motions

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Where is the CG?
Lessons from Another Industry

- Follow the Center of Gravity (CG)!
- How do you analyze this thing?
- Simplify! Do not describe every nook and cranny of this structure.
- Identify where the CG is. Know the density, mass, and inertia of your structure;
- Determine the motion of the CG, Determine the motion of the whole object
- This logic is applied to Pitcherview

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Pitcherview

Pitching Motion Discretization,
Pitching Arm Anatomy Force & Moment Processor

Image Courtesy of Semantic Scholar
https://www.semanticscholar.org/paper/Delivery-and-Pitch-Type-Alter-Ground-Reaction-in-Kass/53503e2308bcdb6462b1b02d1229ee41ef553cdf/figure/4

Caption:

- This image shows the flight of the pitcher/baseball combo CG from the set position to the release point
- Shows the forward flight of the baseball only, from the set position
- Use this discretization to determine free body forces an moments on the CG, and related parts
- Determine FBD for each state. Solve FBD.
- Conglomerate constitutive equations.
- The pitching motion is characterized with physics quantities

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Potential Use #1 of Pitcherview

- A Team needs to decide whether to send Tristan Mackenzie out for the eight inning. We observe that:
  - His leg kick height has dropped by several inches
  - His windup arm motion has decreased by several inches
  - His velocity is still 95 mph.

- Conclusion:
  - In order to make up for the lost energy from the decrease in pitching motion, Mackenzie is likely making up for it with increased effort in his arm movement.
  - We may or may not be able to observe the increased effort
  - In order to prevent injury, recommend sending in the reliever

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