Development and Research of Serious Game

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My Background

KAERI	Research in Nuclear Power Plant Computational Fluid Dynamics Numerical Simulation
JOYON Entertainment	Company pursuing development of online games 20+ commercially published titles Economy simulation game
NEOSWELL Co. Ltd.	Development of Mobile games and Serious games Eco-City, Game of the Month(2012, Serious game) Play This Thing!

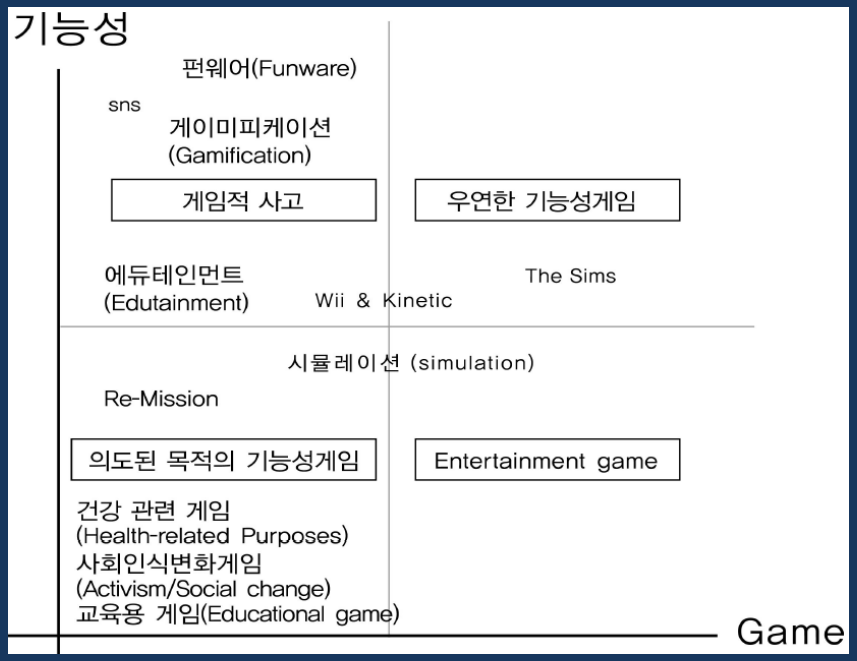
Aim of Today's Talk

0. Definitional Issues
1. Market trends
2. Game titles
3. Companies
4. Project examples
5. Concluding remarks

0. Definitional issues

- Working defn = non-entertainment use of interactive entertainment software and content, primarily for education & training purposes

- Gamification
- Funware



1. Market trends

- Early educational use of computer games in the end of 1990’
- Active envolvement of GOVERNMENT
  - Serious game forum drived by government
  - Government and local government-led content development
  - By the Ministry of Education announced the commercialization of digital textbooks (2012)
  - KSF, GOOD GAME SHOW
- With the proliferation of smart device education content, serious apps became educational mostly

1. Market trends

1) Education

- Government supportted the serious game project competition and the use of serious game
- Educational service companies + Game developers
- A variety of platforms
- The recent proliferation of smart devices, existing mobile content in the form of apps is changing rapidly
- G Running is actively being deployed with spread through the cooperation and support of local government

1. Market trends

2) Medical and health care

- Older people consume the game

- Government supported development of a serious game for dementia support program

- Development project led by the university

- The recent proliferation of smart devices, existing mobile content in the form of apps is changing rapidly

- Collaboration of Medical center and game company for the purpose of helping the rehabilitation and the intellectual development of children with disabilities

- Computer assisted Orthopedic Surgery(CAOS)
  - Surgical simulator for spinal screw insertion composed of virtual roentgenogram, virtual C-arm, and rapid prototyping
  - Dental 3D imaging and treatment planning software
  - Surgical navigation system

1. Market trends

3) Public

- Government support project for public use
  - Hangul education, Dementia, Disability care and Consumer safety
  - Widespread use of arcade games and its negative image
    Government policy; Healthy ecosystems of creating an arcade game

- The spirit of peace as in the DMZ for security awareness

- University; Local traditions and cultural heritage education

- Company; NHN Serious Game Center, environmental education, game of life
  NC + WFP, Game for emergency food relief
  NEXON, Game for Internet manners
  NEOSWELL, Environmental education game ECO-CITY
  PLAYPLUS, Environmental game Oil Spill Control

1. Market trends

4) Enterprise

- Job training in financial and general business functionality
- Financial products applying game factors

1. Market trends

5) Military and defense

- Agency for defense development; Engagement control software, Variable simulator, virtual air engagement model
- Company; Simulation for large scale engagement, Specialized simulation for air/ground combat

2. Game titles

1) Education
2) Medical and health care
3) Public
4) Enterprise
5) Military and defense

2. Game titles

1) Education

Hodoo English

Talklish

Playing

Audition English

2. Game titles

1) Education

Langcon Island

Aranuri

Langcon Island

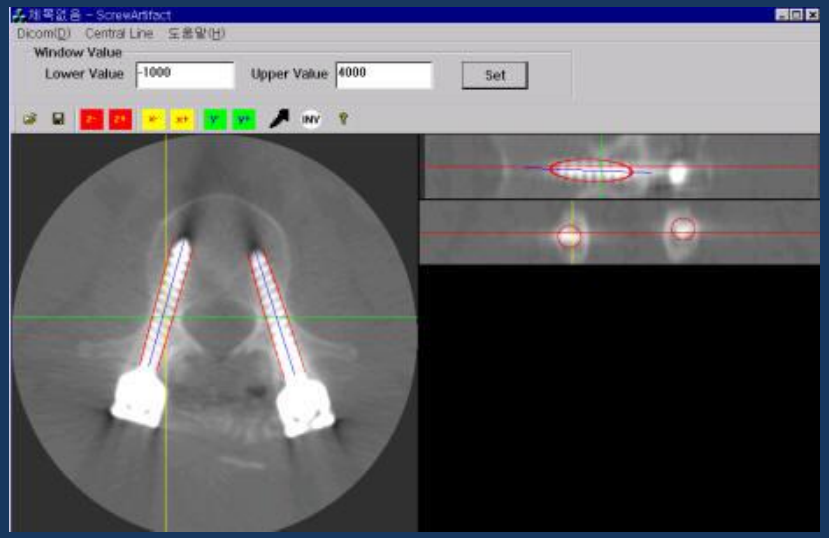
Funtris

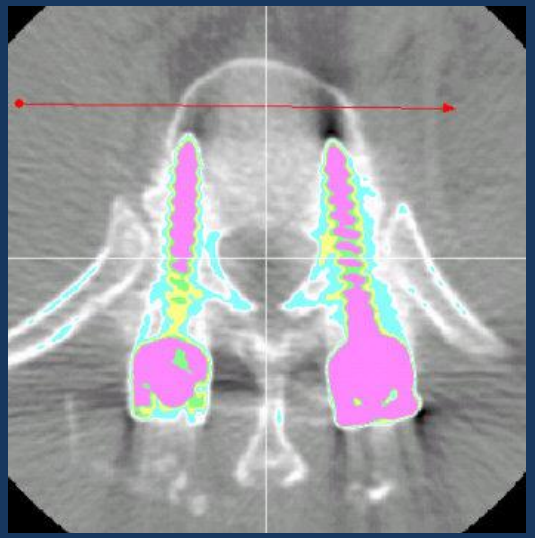
2. Game titles

2) Medical and health care

Medical IV Simulator

Emergency Care Simulator

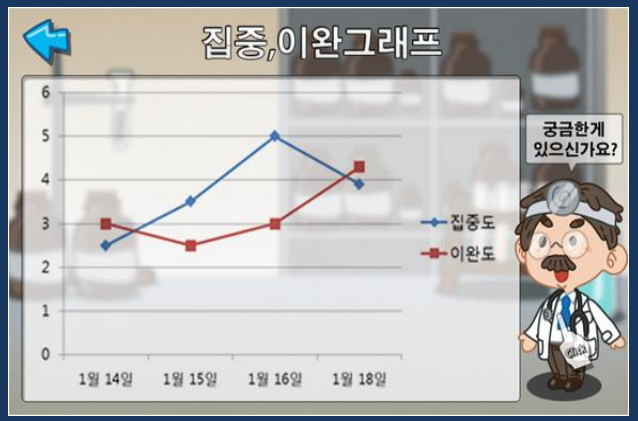




Patient-specific surgical simulator for spinal screw insertion

2. Game titles

2) Medical and health care



BCI based serious game for ADHD (DEC KOREA)

Paldogangsan(HOSEO UNIV)

2. Game titles

3) Public

NANU Planet

ECO-CITY

Ecofrienz

Food Force

2. Game titles

4) Enterprise

Pax Hana

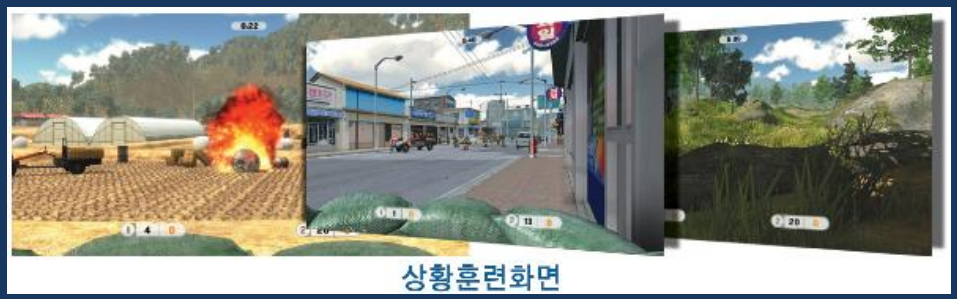
Talking Savings

2. Game titles

5) Military and defense

기록사격 통제화면

실거리사격 훈련화면

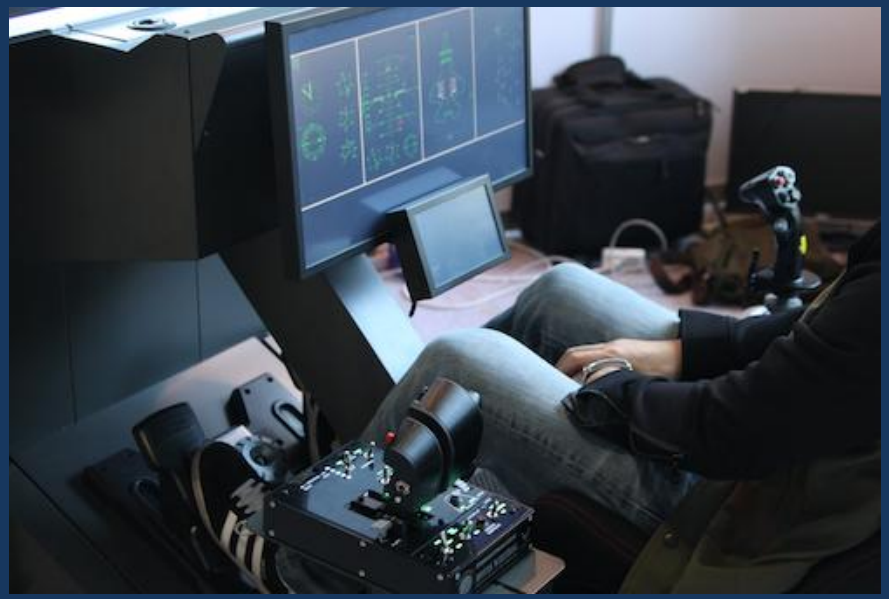


상황훈련화면

Real Shooting Simulator

2. Game titles

5) Military and defense



Air combat simulator

3. Companies

Classification	Important developers/ Distributers		Important developers/ distributers(duplicated)	
	No.	%	No.	%
Education	28	45.2	53	46.9
Medical & health care	15	24.2	29	25.7
Public	10	16.1	10	8.8
Enterprise	5	8.1	14	12.4
Military and defense	3	4.8	5	4.4
N/A	1	1.6	2	1.8
Total	62	100.0	113	100.0

4. Project examples

- ECO-CITY
- TMaG-MATT-Simulator
- Surgical Approach Training system

4. Project examples

1) ECO-CITY

- Started with support of Korean government(SBA)
- Selected as 'The game of the month' from KOCCA(2nd quarter of 2012)
- City builder game with eco-friendly bldgs and environmental objects
- Users manage their city and control its energy usage.
- Collected wastes can be the game money with exchange rate.
- Visiting a friend in the city, as an environmental watchdog, you can get 'eco-points'.
- Junk shop; a system for recycling waste as a resource.
- Eco Lab: Creating a sustainable city various studies would be done.
- Carbon Gauge: The pollution level showing the carbon dioxide.
- Natural disasters can be avoided by many kinds of activities.
- Not based on science but...

4. Project examples

1) ECO-CITY

4. Project examples

2) TMaG-MATT-Simulator

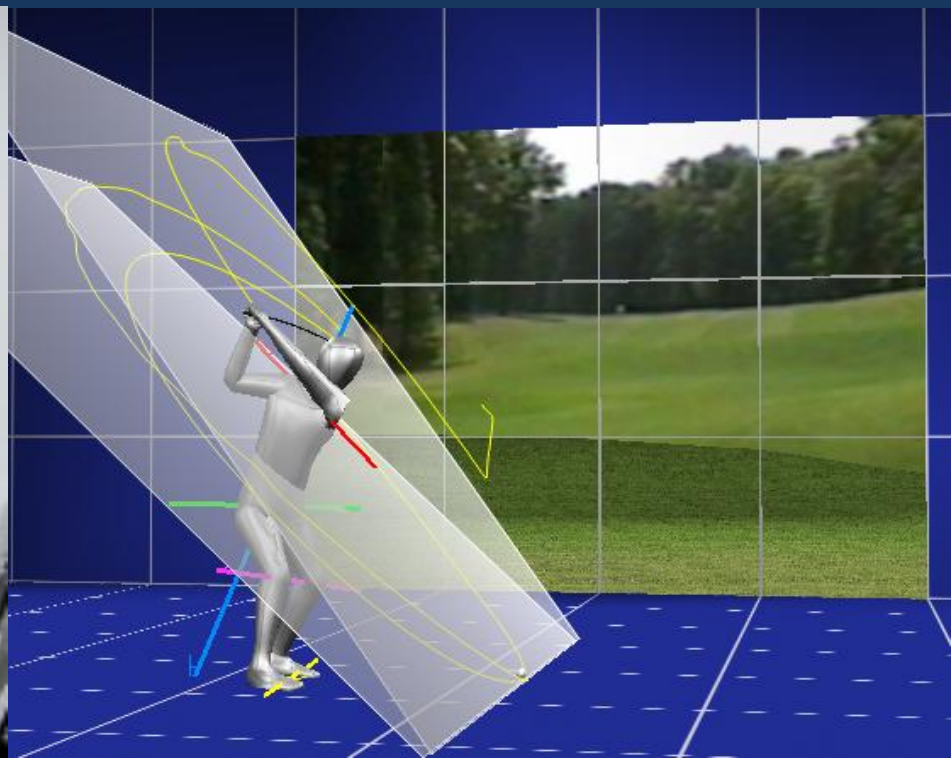
- Developer; NEOSWELL
- Service and Operation; PLAYSOFT
- To create simulation on real golf courses of a player using his MATT session data.
- A dedicated web site for MATT customers which would allow them, using their MATT data, to visualize what would be their performance on actual golf courses.
- Core Technology; Physics Engine for very Accurate Ball Flight Simulation, Swing Dynamics

MATT-SIMULATOR FOR TAYLORMADE-ADIDAS

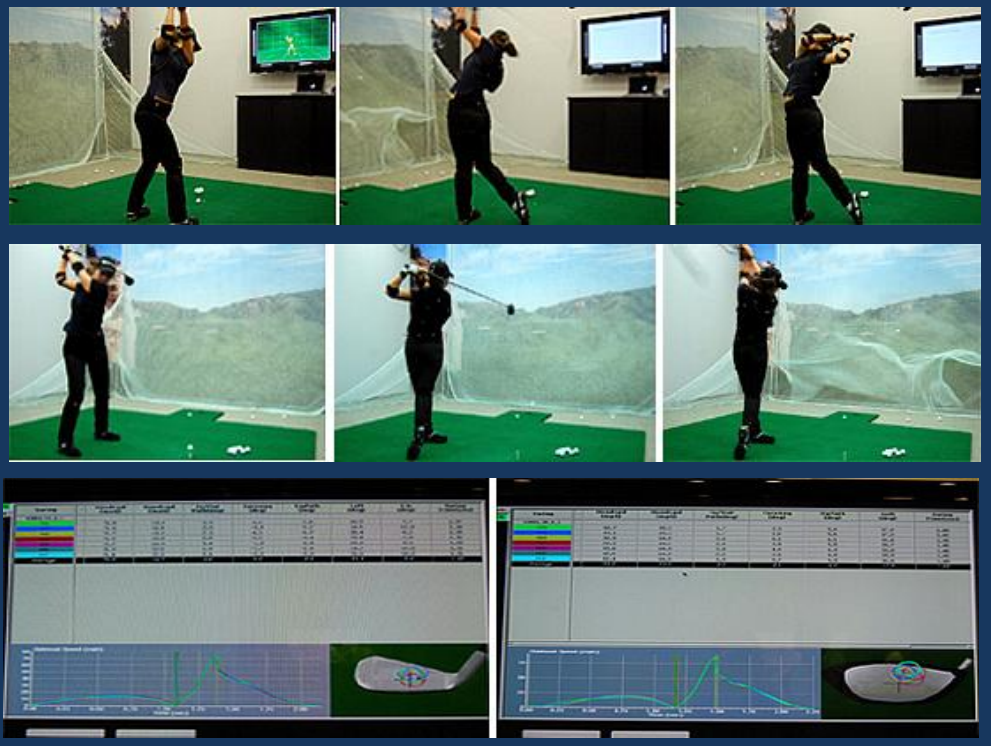
1. Introduction
   - Surfing our system to be developed
2. Description
   - Features

MATT; Innovative and Unique
Fitting System Ever
But to be Selling and Marketing System Now

Start your own swing and ideal drivers from MATT!



• MATT System and Custom Fit Club System



Recommend swing motion and Custom Fit Clubs can be brought to the system from MATT.

MATT Online Simulator SURFING

Inform, Inspire, Influence

MATT

Information

Event

User Experience

Fun

Club

SNS

Focusing Strategy

MATT

EASY PLAY

REALITY

Easy-to-Access;

Browser Based, Platform Free

Easy-to-Experience;

Mouse Clicking Only

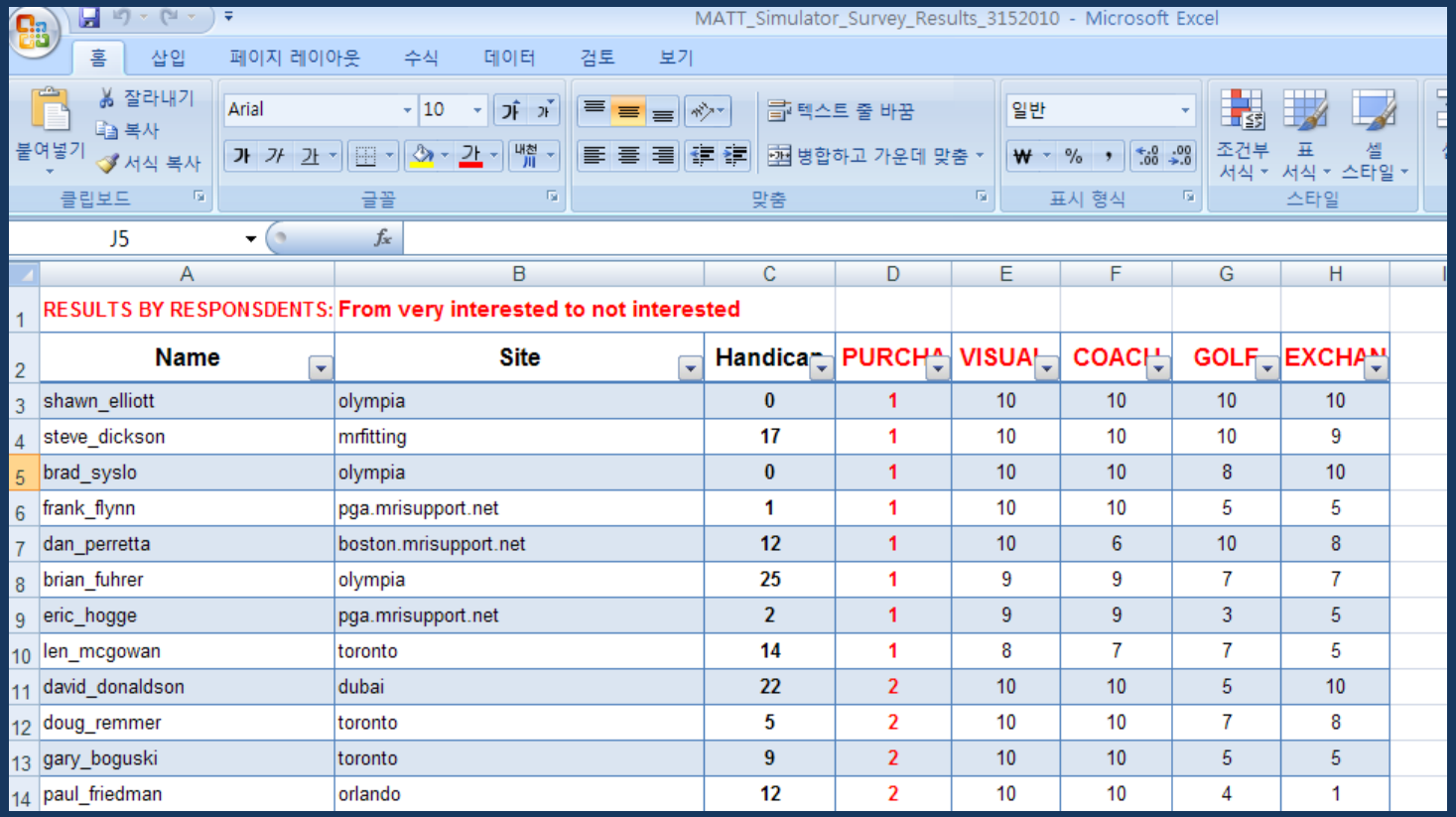
Enjoy Real Golfing;

Quality Graphics and Physics

Enjoy Real Courses;

The Greatest Real Courses

Research and



	A	B	C	D	E	F	G	H
1	RESULTS BY RESPONSDENTS:	From very interested to not interested						
2	Name	Site	Handicap	PURCHA	VISUAL	COACH	GOLF	EXCHAN
3	shawn_elliott	olympia	0	1	10	10	10	10
4	steve_dickson	mrfitting	17	1	10	10	10	9
5	brad_syslo	olympia	0	1	10	10	8	10
6	frank_flynn	pga.mrisupport.net	1	1	10	10	5	5
7	dan_perretta	boston.mrisupport.net	12	1	10	6	10	8
8	brian_fuhrer	olympia	25	1	9	9	7	7
9	eric_hogge	pga.mrisupport.net	2	1	9	9	3	5
10	len_mcgowan	toronto	14	1	8	7	7	5
11	david_donaldson	dubai	22	2	10	10	5	10
12	doug_remmer	toronto	5	2	10	10	7	8
13	gary_boguski	toronto	9	2	10	10	5	5
14	paul_friedman	orlando	12	2	10	10	4	1

Description

The Greatest Real Golf Courses

Start your own swing and ideal drivers from MATT!

Augusta National in Georgia
Pine Valley in New Jersey
Cypress Point in California.
North West - Bandon Dunes, Oregon
Northern CA - Pebble Beach
Southern CA - Torrey Pines
Hawaii - Kapalua
Mid-Atlantic - Stonewall, Virginia
Upper Midwest - Whistling Straights, Wisconsin
Lower Midwest - Longaberger. Ohio
New England - Pine Hills, Massachusetts
New York Area - Bethpage Black, Long Island, NY
Rocky Mountains - Pole Creek, Colorado

Features ; Visual Reality

- **Spectacular views of the 18 hole championship golf courses**

Real high resolution 3D graphics with contoured terrain and obstacle definition - balls bounce off trees, carts etc. and roll down hills - even into water with a splash as in the real fields.

• High Quality Graphics

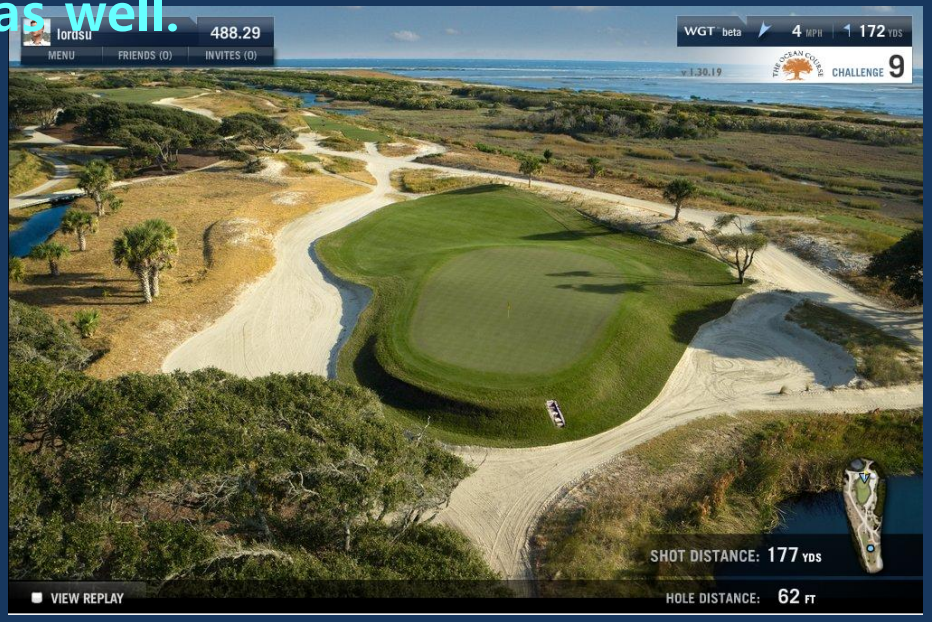
The actual implementation of the course as in the real fields
Day and night, the implementation of various weather environment

Features ; Realistic Feeling

- **Actual feeling of likely standing in real Courses**

Realistic feeling full implementation of the course!!

Not only do they have the same look and feel of the real course, but they play like the real course as well.



Features ; Physics

Ball Flight Physics

Collision Model

Terrain Physics

Wind Effect

Elevation Effect

Water Effect

• Ball Flight Physics;
Realistic ball flight trajectory, bounce and roll

Including hooks, slices, pushes, pulls, fades and draws or any combination thereof, i.e. pushed hooks, pulled slices etc. plus wind factors are also taken into account .

When chipping and putting, the ball will follow the contour of the surface and it's path and speed will be influenced accordingly.

The flight trajectory calculation routines use accurate mathematical formulas that use all the parameters of the clubface at impact with the ball together with the ball's initial flight angles and velocities.

"Flight Mechanics of a Spinning Dimpled Spheroid"

Lift Coefficient

$$C_L = \frac{L}{\frac{1}{2}\rho V^2 A}$$

Drag Coefficient

$$C_D = \frac{D}{\frac{1}{2}\rho V^2 A}$$

Reference Area

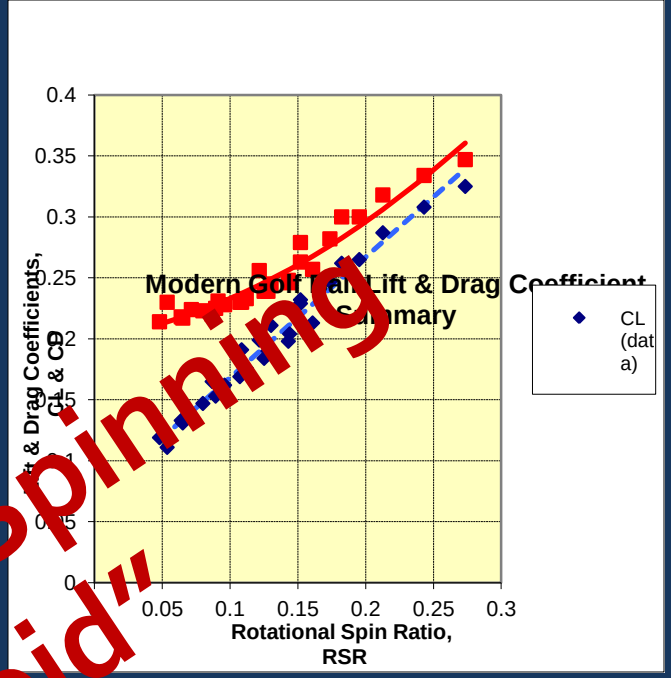
$$A = \pi r^2$$

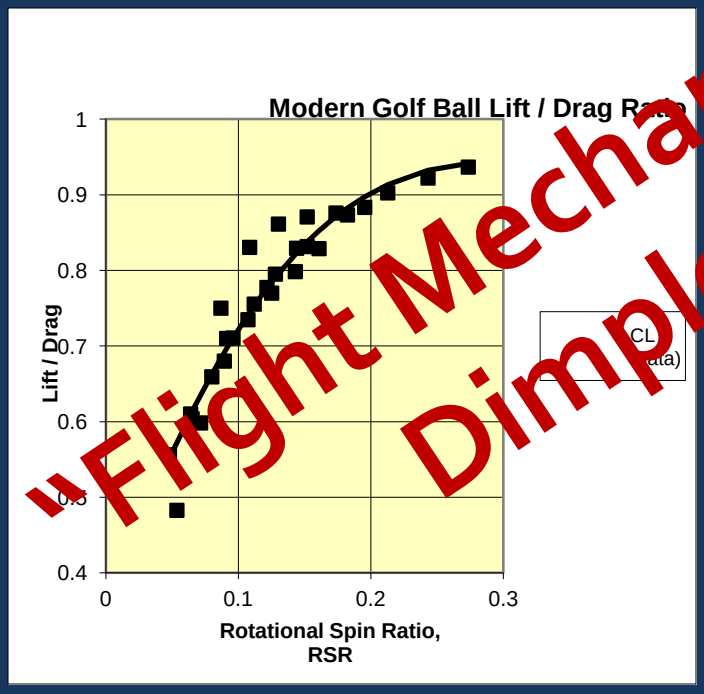
Equation of State

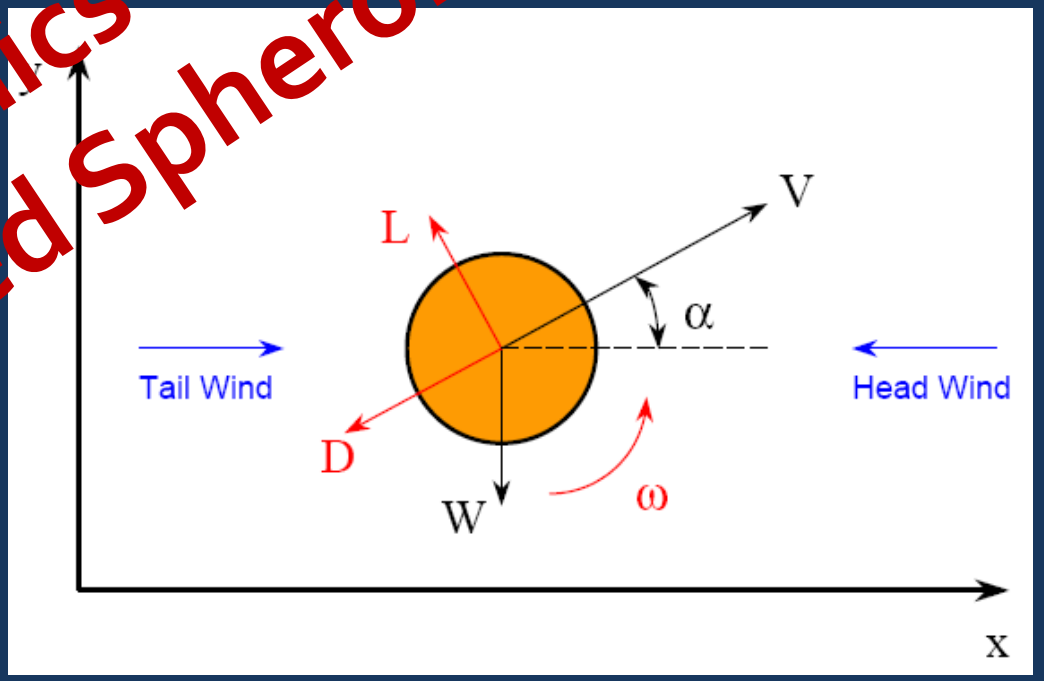
$$p = \rho RT$$

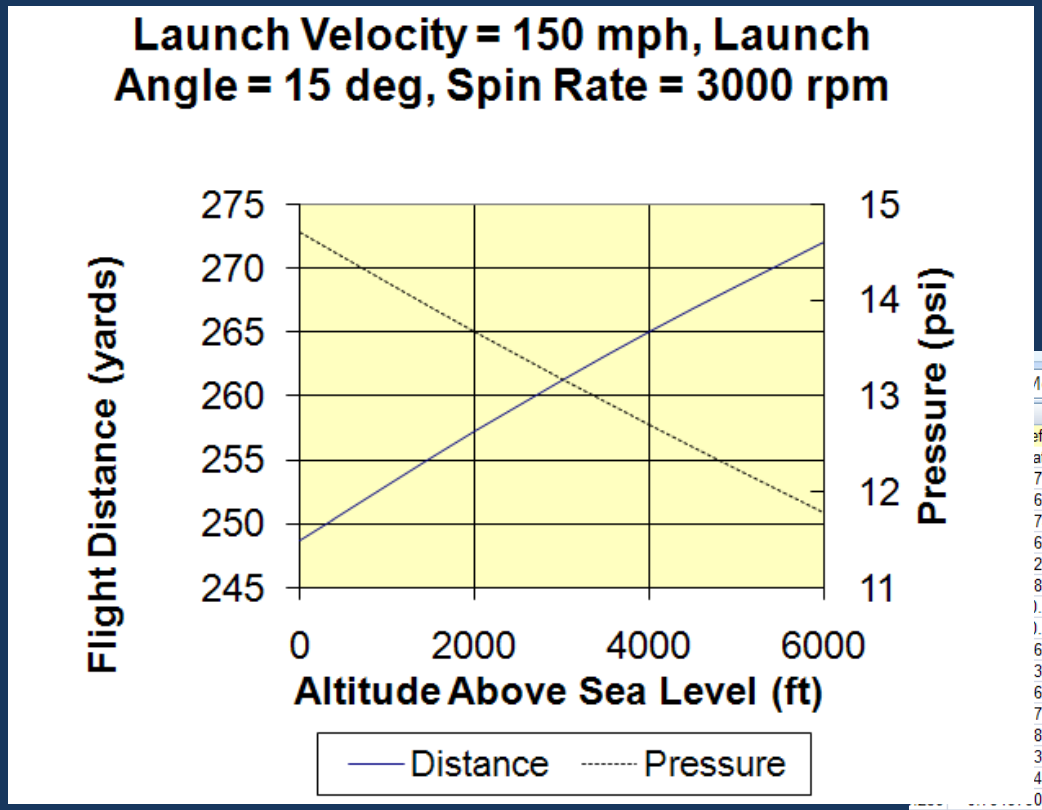
Rotational Spin Ratio

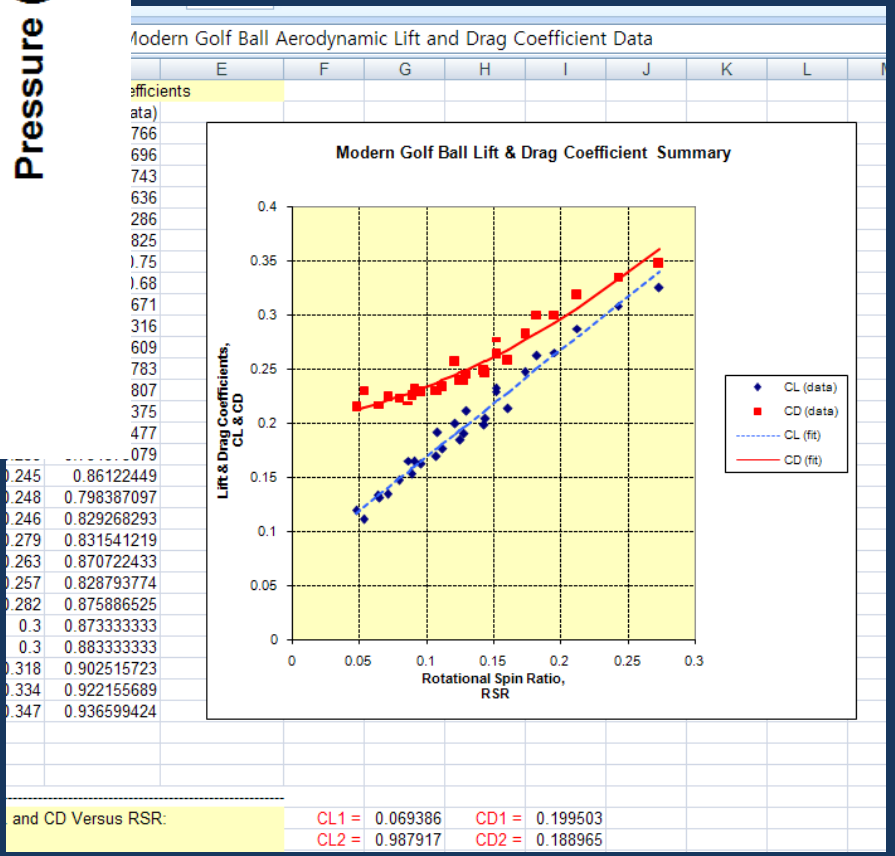
$$RSR = \frac{2\pi\omega r}{V}$$








Launch Velocity = 150 mph, Launch Angle = 15 deg, Spin Rate = 3000 rpm
Flight Distance (yards)
275
270
265
260
255
250
245
Pressure (psi)
15
14
13
12
11
0
2000
4000
6000
Altitude Above Sea Level (ft)
Distance
Pressure


Modern Golf Ball Aerodynamic Lift and Drag Coefficient Data
Modern Golf Ball Lift & Drag Coefficient Summary
Lift & Drag Coefficients, CL & CD
Rotational Spin Ratio, RSR
CL (data)
CD (data)
CL (fit)
CD (fit)
and CD Versus RSR:
CL1 = 0.069386
CD1 = 0.199503
CL2 = 0.987917
CD2 = 0.188965

Features ; Real Golf Play

Replay & Analysis

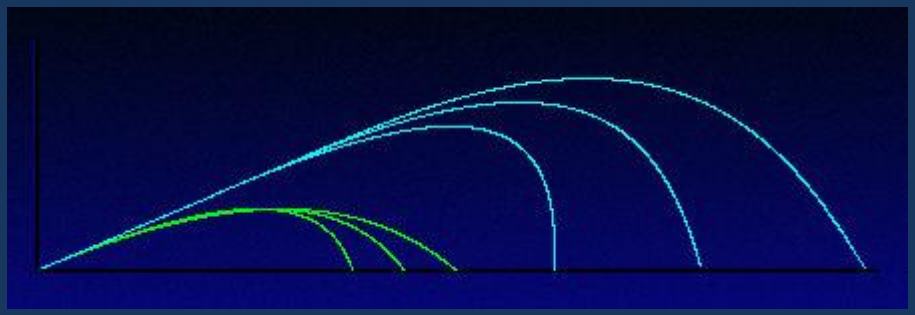
MATT System

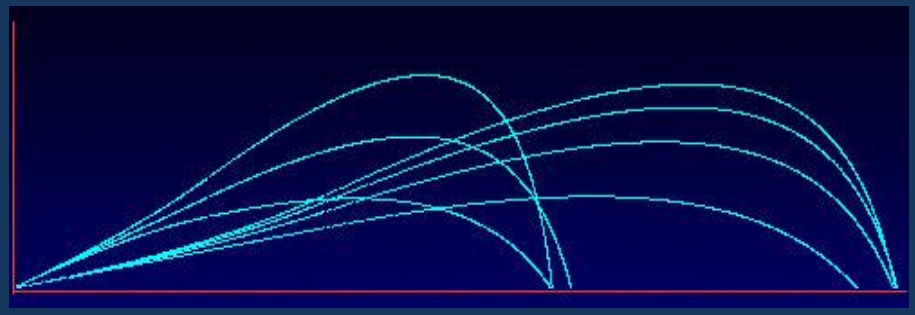
• Integrated Swing Analysis

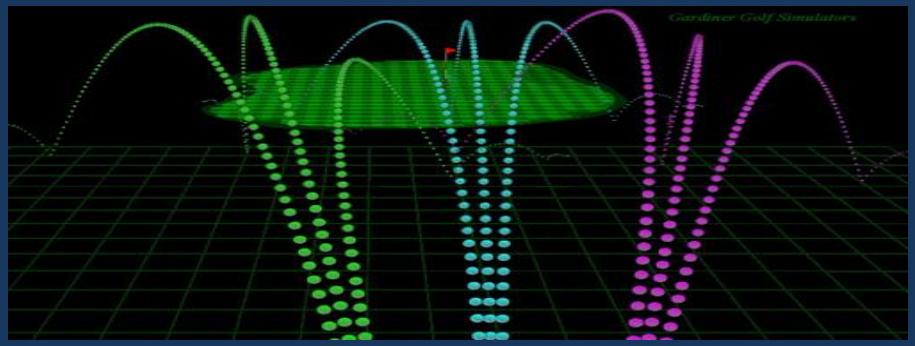
The users can see why the ball flew the way it did.

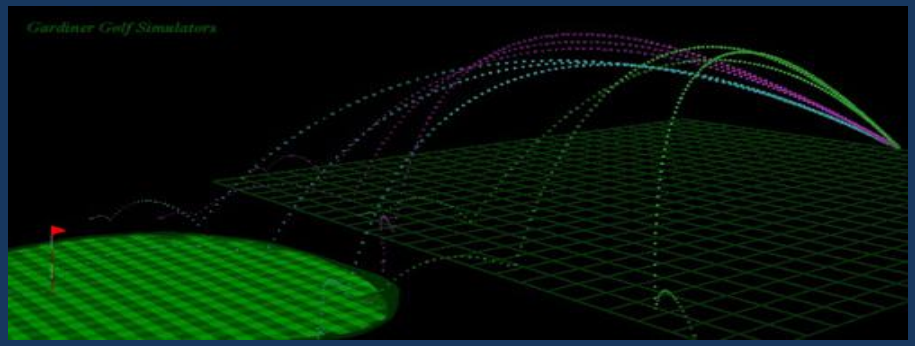
The system focuses strongly on feedback information that will truly help an user to improve his game with the help of MATT system.

The data is shown graphically in pop-up windows after every shot and include club head speed, club face angle, club head angle of approach, club head path, club head height above ground, tee height, ball position on club-face at impact, effective club-face loft, ball spin rates and directions, launch path angle, ball launch vertical angle and ball launch velocity.









Improving their ability to get optimal condition through many times of tuning their drivers, for instance

• Statistics and Replay the Game

Import Real Data and Replay for Users

Other Features

- Elevation Conditions
- Green Conditions - hardness and speed
- Wind Conditions - both direction and velocity
- Weather Conditions - from blue skies to torrential rains
- Time-of-Day Conditions - experience the beauty of the course in every light

4. Project examples

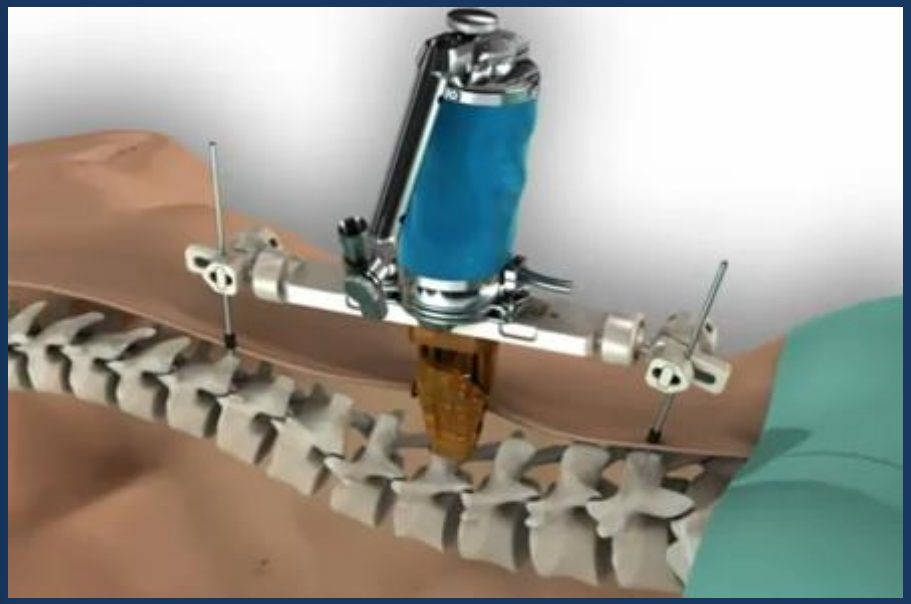
3) Surgical Approach Training System

- Cadaver?

- Spine, Knee, Joint

Open Surgery

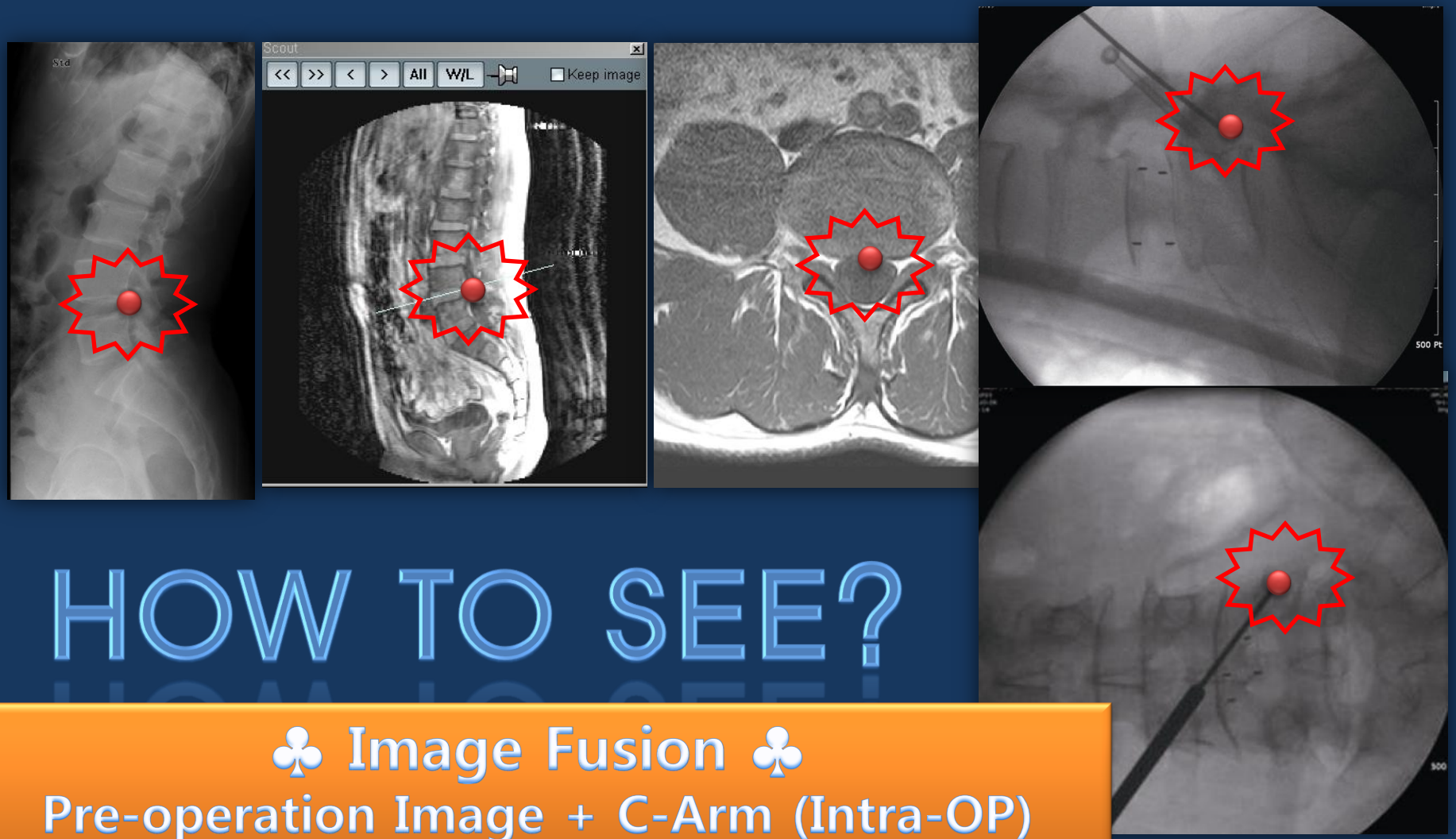
Endocopic Surgery



- Fast Recovery for patient
- Minimized Scar
- Bloodless Surgery
- Short Operation Time
- Local Anesthesia
- Protect Normal Tissue

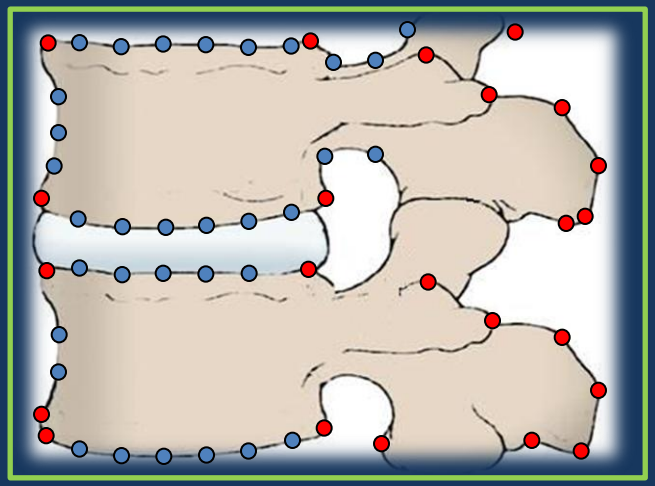
4. Project examples

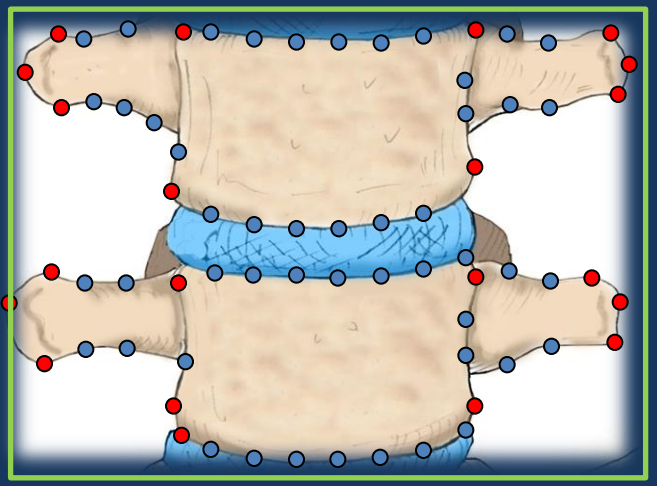
3) Surgical Approach Training System

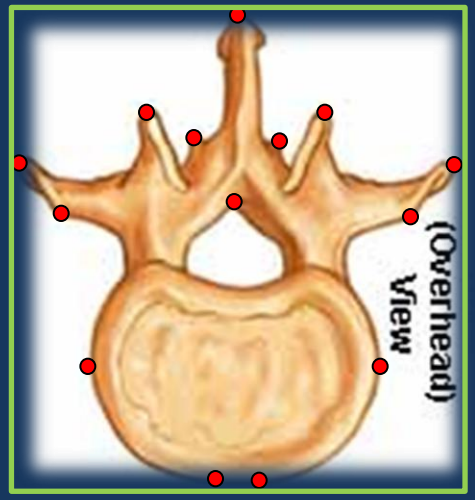


4. Project examples

3) Surgical Approach Training System



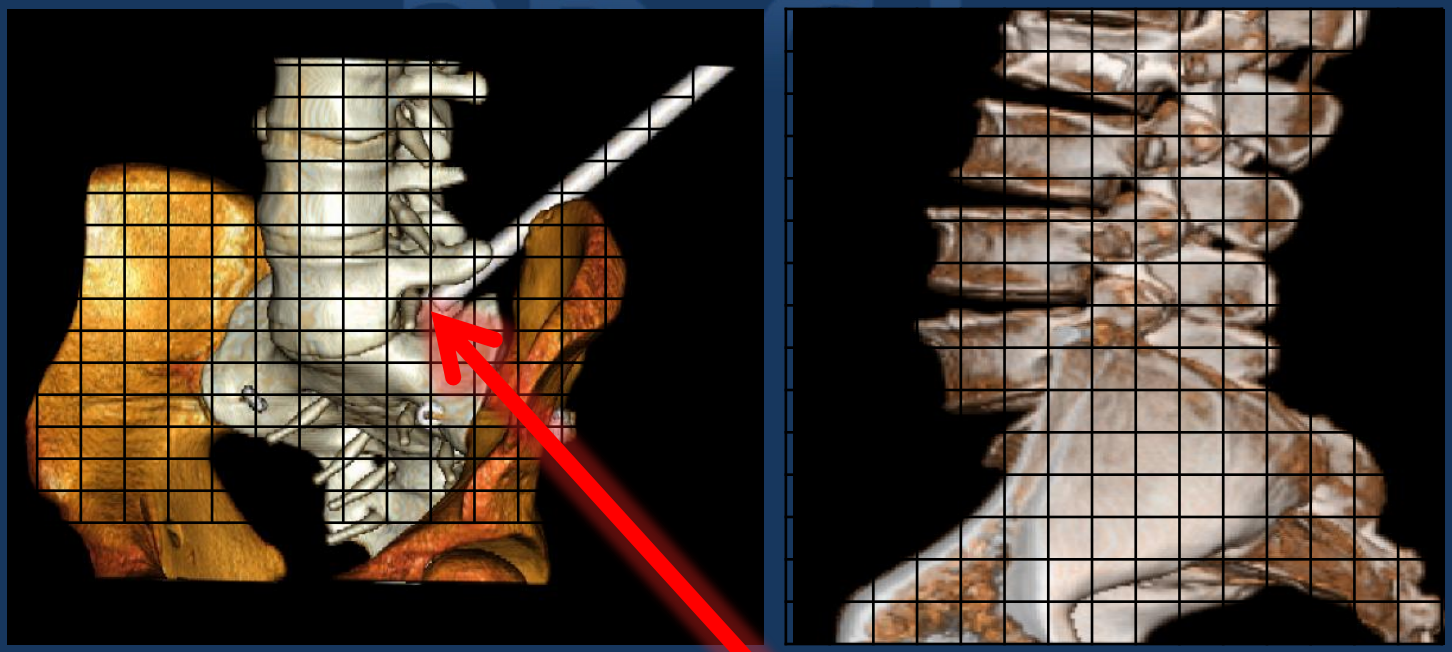




4. Project examples

3) Surgical Approach Training System

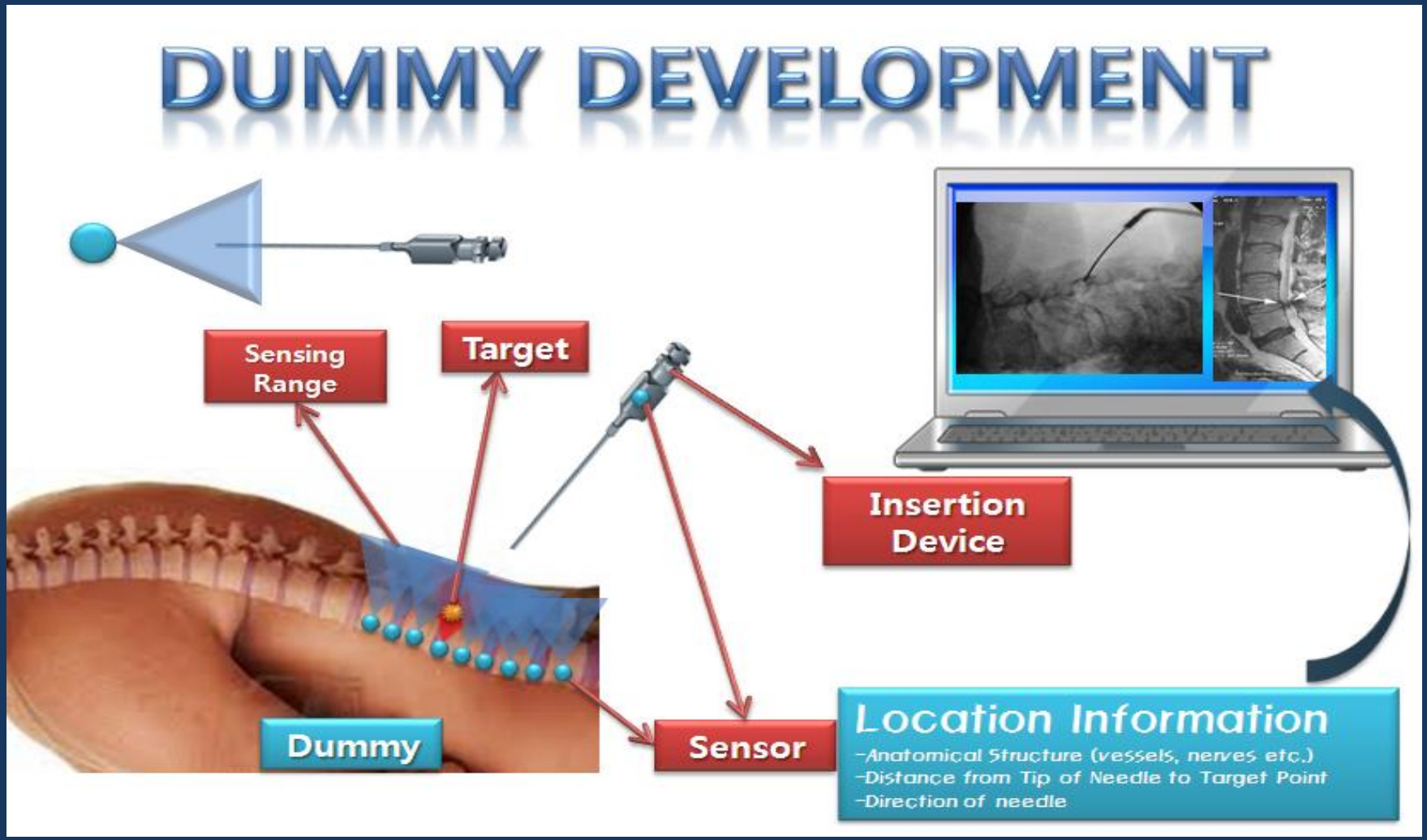
3D CT



Target Area

4. Project examples

3) Surgical Approach Training System

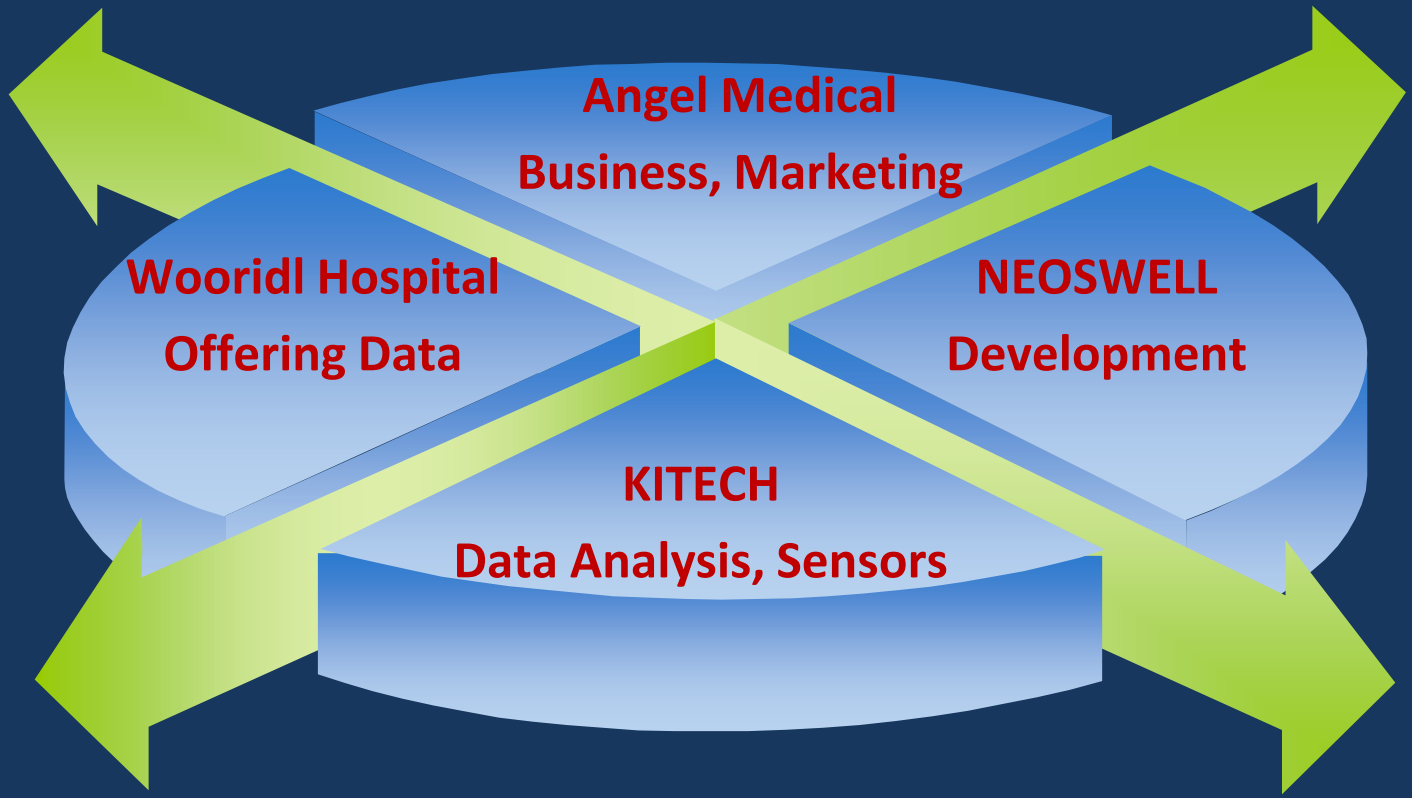


4. Project examples

3) Surgical Approach Training System

4. Project examples

3) Surgical Approach Training System



5. Concluding remarks

- Emerging themes related to serious games
- Some of the issues relevant to government
- Some examples of important use of SG
- Some practical examples of SG
- Industry/academia spotting the market opportunities:
  Annual Serious Games Show/Forum/Conference
- Collaborative partnerships; innovation, new product , market expansion
- Where is the market?
- Yet much of industry remains sceptical:
  "no mass-market appeal"
  "show me the money out of this!"

From industry's perspective, prospect of viable business models remains uncertain...

- More collaborative pilot work needed between industry, govt & academia

THANK YOU !