Leveraging HK technologies for smart ageing

Dr. Vincent Lau
R&D director, Software & Systems,
ASTRI

About ASTRI

ASTRI is a government subvention organization, focusing on R&D on information and communication technologies (ICT), with a mission to perform high quality R&D and transfer technologies to the industries.

Key R&D areas

ASTRI is the largest R&D centre in Hong Kong with an annual funding around HK$410M.

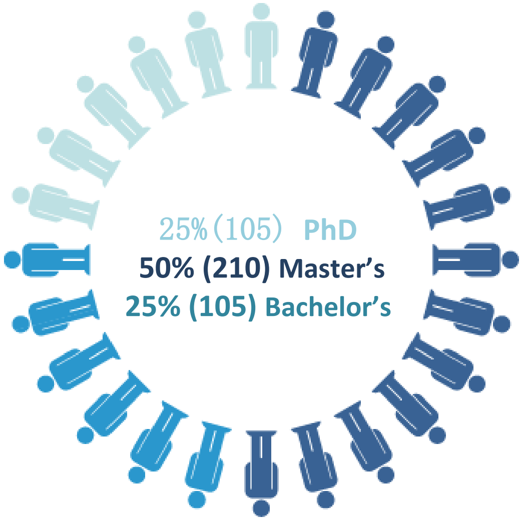
Key R&D areas include:

- IC design
- Sensors
- Modules
- Packaging
- Li-ion battery materials
- Embedded software (e.g. MBD)
- Cloud computing
  (e.g. cyber security, big data analytic)
- Wireless network (e.g. 5G, RF antenna design)

and others, covering an extensive range of technological fields

R&D Capability

Among the current 500-strong staff, 420 (~85%) are R&D talents, 25% of which hold a PhD degree, 50% Master's and 25% Bachelor's.



Four Types of Project Funding

Cash Rebate Scheme
Industry partner is eligible for **30%** cash rebate from ITC on sponsoring projects, except for sponsorship in form of licensing

ASTRI's R&D projects are funded mainly by Innovation and Technology Commission (ITC) of HKSAR Government through the Innovation and Technology Fund (ITF)

ITF-funded Seed Project

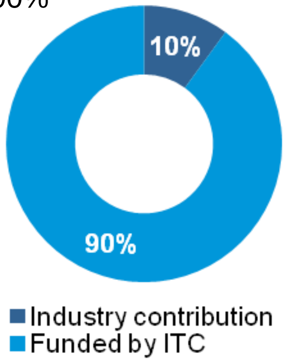
- Forward-looking/ exploratory work to provide foundation work for future projects
- Capped at 2.8M HKD

ITF-funded Platform Project

Source of fund

Industry contribution：
≥ 10% (≥ 1 company)

Funded by ITC：
≤ 90%



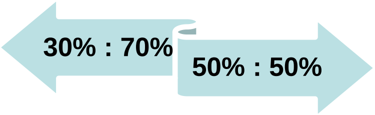
- ASTRI owns all IP rights but industry partners can license the IP non-exclusively

Industry Collaborative Project

Source of fund

Industry contribution：
30-50%

Funded by ITC：
50-70%

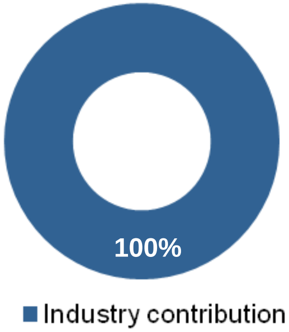


- Industry contribution
30%：Industry partner can exclusively license the foreground IP for a period
50%：Industry partner can own the foreground IP

Contract Research

Source of fund

Industry contribution：
100%

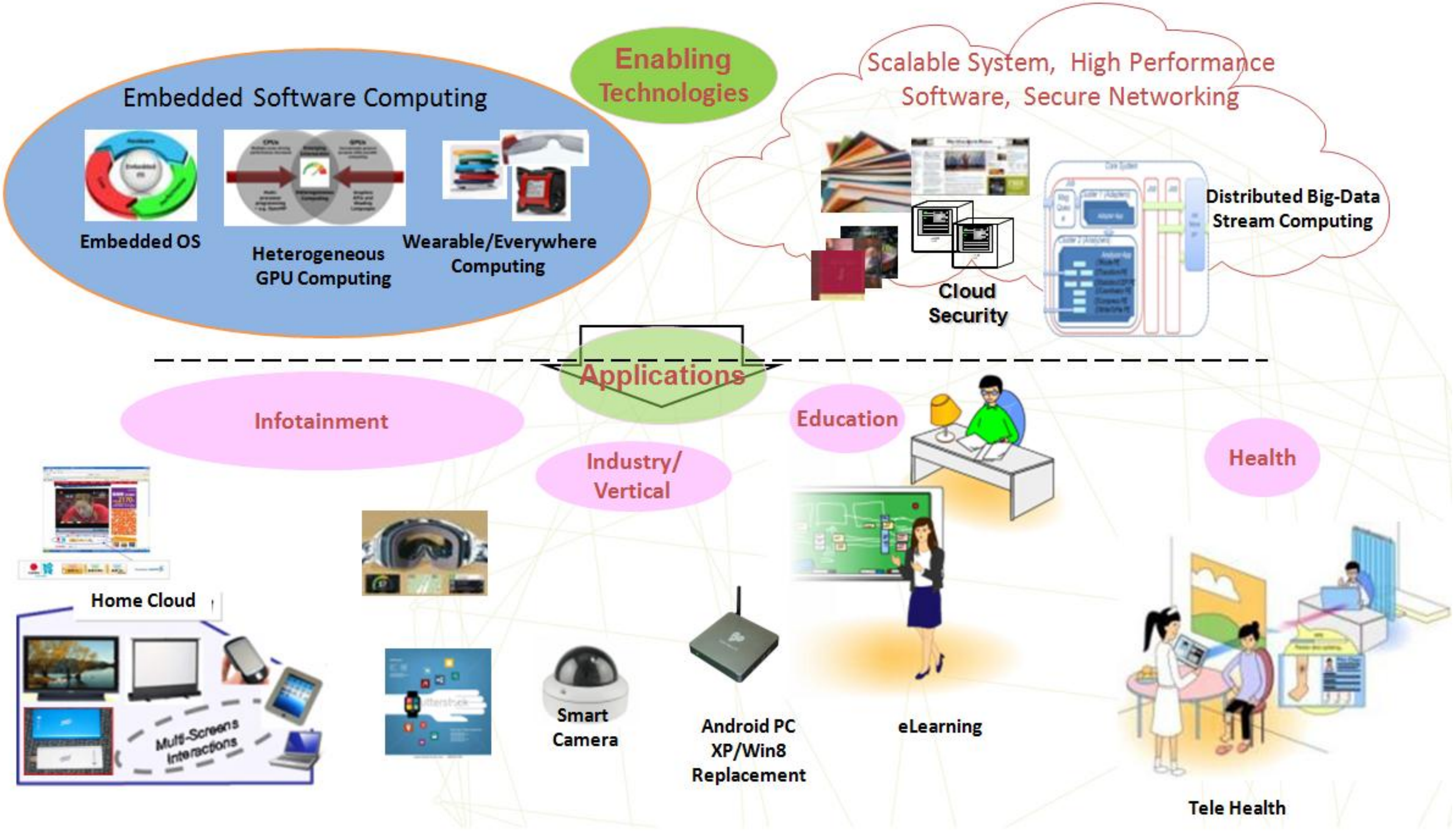


- Industry partner can own the foreground IP

Applied technology for various market segments

- Finance
- Government Services
- Manufacturing
- Health and Medical
- Consumer
- Education
- Big Data
- Smart City
- Communication
- Others…

Software & Systems - Overview



Embedded Software Computing

Embedded OS

Heterogeneous GPU Computing

Wearable/Everywhere Computing

Enabling Technologies

Scalable System, High Performance Software, Secure Networking

Distributed Big-Data Stream Computing

Cloud Security

Applications

Infotainment

Industry/ Vertical

Education

Health

Home Cloud

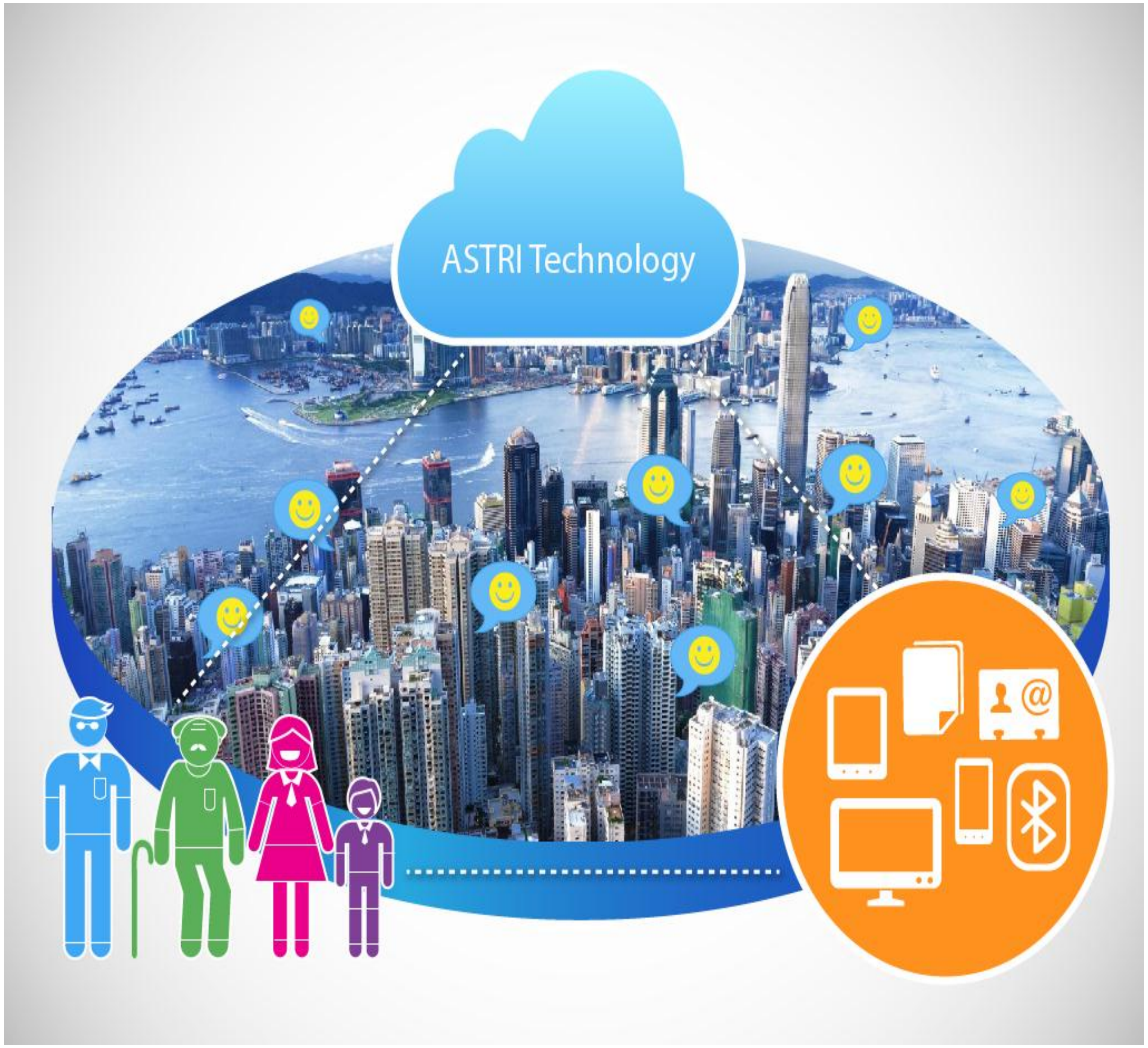
Smart Camera

Android PC XP/Win8 Replacement

eLearning

Tele Health

Smart City solutions



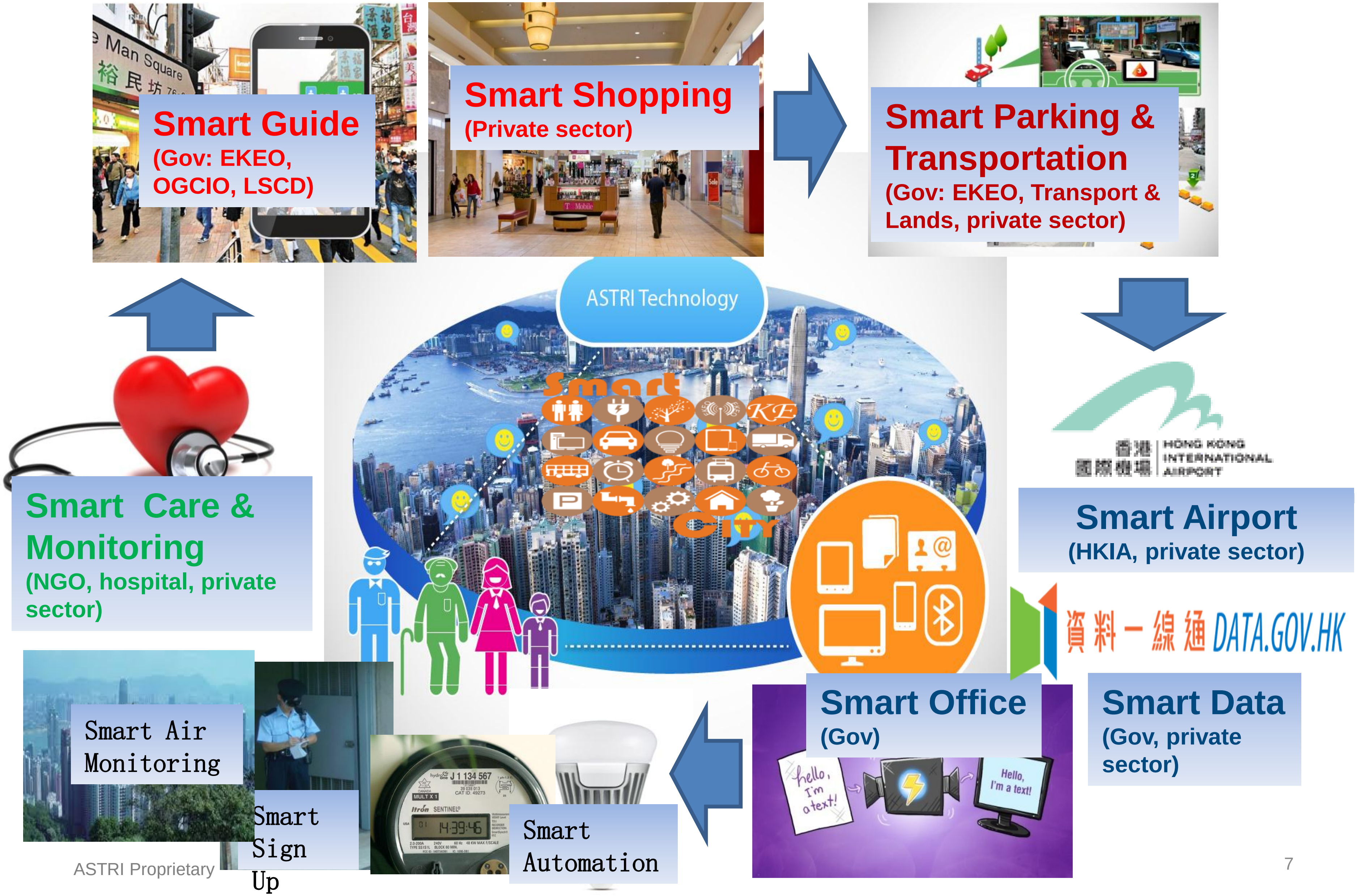
Technology

- Embedded & mobile software
    - Data acquisition & sensor fusion
    - Mobile computing System
    - Proximity, IoT & GIS
    - Scalable and elastic cloud
    - operational & management
- Cloud security & analytic
- Communication infrastructure

Data

- Geo & proximity
- Health
- Transport
- Government open data
- Environmental sensor

ASTRI technologies and applications


ASTRI Technology
Smart
KE
CITY
香港國際機場 HONG KONG INTERNATIONAL AIRPORT
資料一線通 DATA.GOV.HK
hello, I'm a text!
Hello, I'm a text!

Smart Guide
(Gov: EKEO, OGCIO, LSCD)

Smart Shopping
(Private sector)

Smart Parking & Transportation
(Gov: EKEO, Transport & Lands, private sector)

Smart Airport
(HKIA, private sector)

Smart Data
(Gov, private sector)

Smart Office
(Gov)

Smart Automation

Smart Sign Up

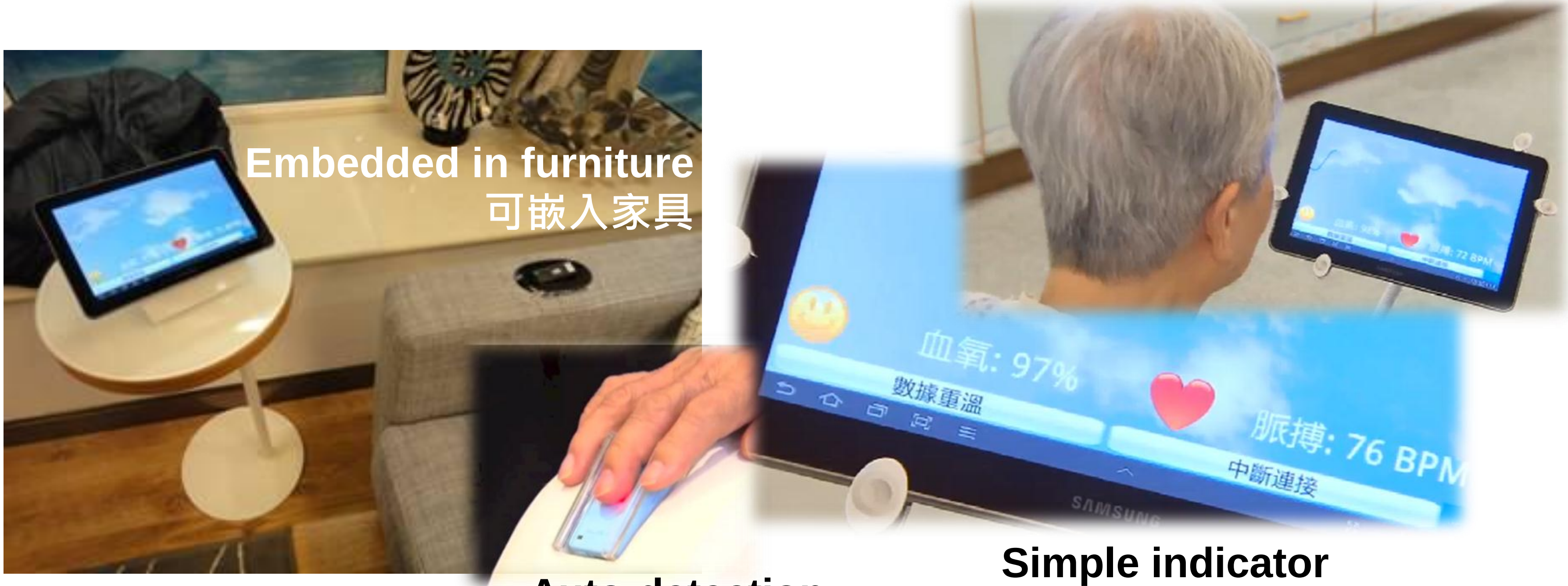
Smart Air Monitoring

Smart Care & Monitoring
(NGO, hospital, private sector)

ASTRI's Technologies in iHome (Elderly)
應用在房協長者資源中心的技術

Reflective pulse oximeter for measuring the pulse oximetry, pulse rate and breathing rate of elderly at home
反射式血氧儀讓老年人可在家測量血氧飽和度,脈搏和呼吸率

Measurement results can be displayed, stored or sent automatically to authenticated care-givers/family members
測量結果可以顯示, 儲存或自動發送到照顧者/家庭成員



Embedded in furniture
可嵌入家具

Auto-detection
自動檢測

Simple indicator
易明的指標

Health Hub for Medical Professionals
供護理員使用的電子健康測量系統

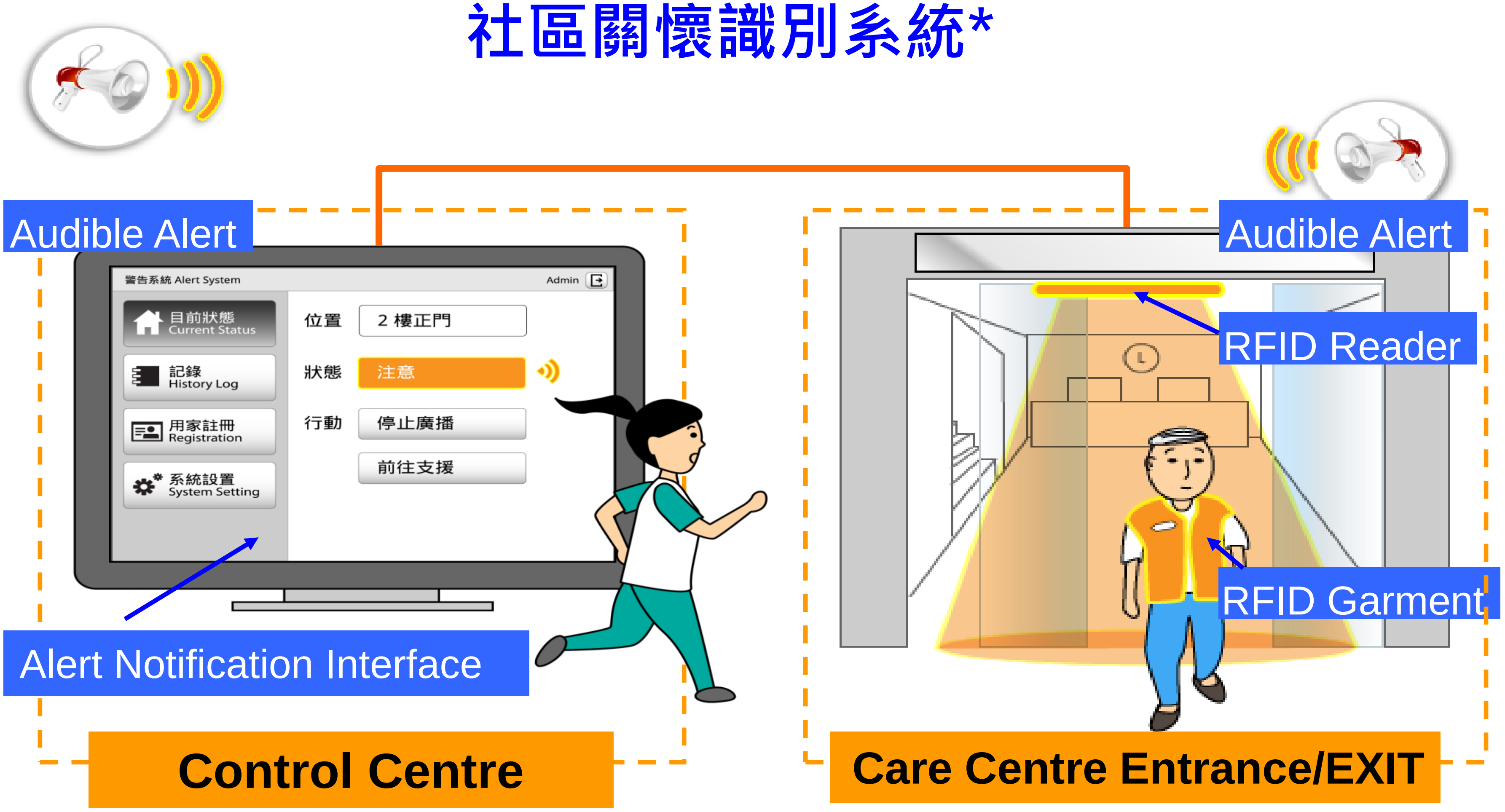
Elderly friendly interface design
長者友好的界面設計

Instant health condition indication
即時健康狀態指示

ASTRI
omron
138
91
107
HONG KONG HOUSING SOCIETY
「長者智能樂安居」開展禮
"Safe Living For Smart Elderly" Launching Ceremony

ASTRI’s Technologies in TWGHs
應用在東華三院的技術(1)

社區關懷識別系統*



Audible Alert
Audible Alert
RFID Reader
RFID Garment
Alert Notification Interface
Control Centre
Care Centre Entrance/EXIT
警告系統 Alert System
Admin
目前狀態 Current Status
記錄 History Log
用家註冊 Registration
系統設置 System Setting
停止廣播
前往支援

位置 2 樓正門

狀態 注意

行動

*與HKRITA及LCSM共同合作開發

ASTRI Proprietary

ASTRI's Technologies in TWGHs
應用在東華三院的技術(2)

社區關懷識別系統

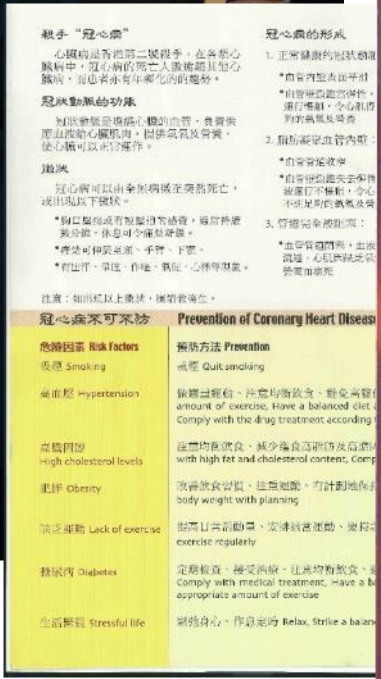
東華三院
社區照顧識別系統
Initializing

培訓與測試安裝的系統

Push bar to open

Elderly E-Education 長者電子教育

世界卫生组织



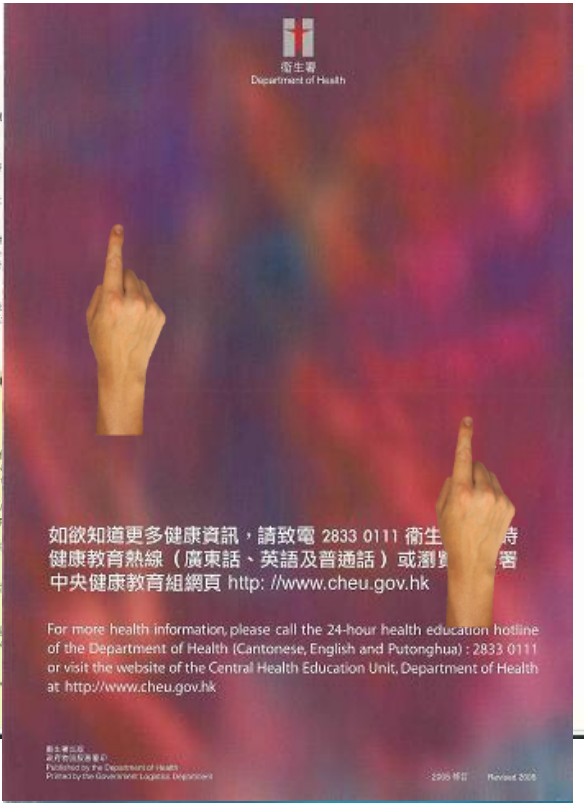
殺手"冠心病"

冠狀動脈的功能

冠心病的形成

冠心病來可來防 Prevention of Coronary Heart Diseas

危險因素 Risk Factors	預防方法 Prevention
吸煙 Smoking	戒煙 Quit smoking
高血壓 Hypertension	amount of exercise, Have a balanced diet Comply with the drug treatment according
高膽固醇 High cholesterol levels	with high fat and cholesterol content, Comp
肥胖 Obesity	body weight with planning
缺乏運動 Lack of exercise	exercise regularly
糖尿病 Diabetes	Comply with medical treatment, Have a b appropriate amount of exercise
生活緊張 Stressful life	Relax, Strike a balan



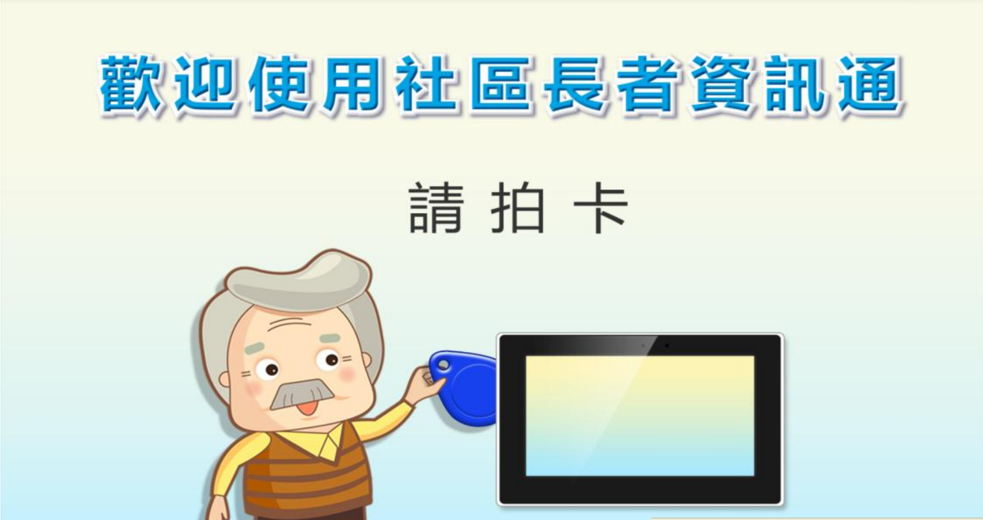
衞生署
Department of Health

如欲知道更多健康資訊，請致電 2833 0111 衞生 時
健康教育熱線（廣東話、英語及普通話）或瀏 署
中央健康教育組網頁 http: //www.cheu.gov.hk

For more health information, please call the 24-hour health education hotline of the Department of Health (Cantonese, English and Putonghua) : 2833 0111 or visit the website of the Central Health Education Unit, Department of Health at http://www.cheu.gov.hk

Published by the Department of Health
Printed by the Government Logistics Department

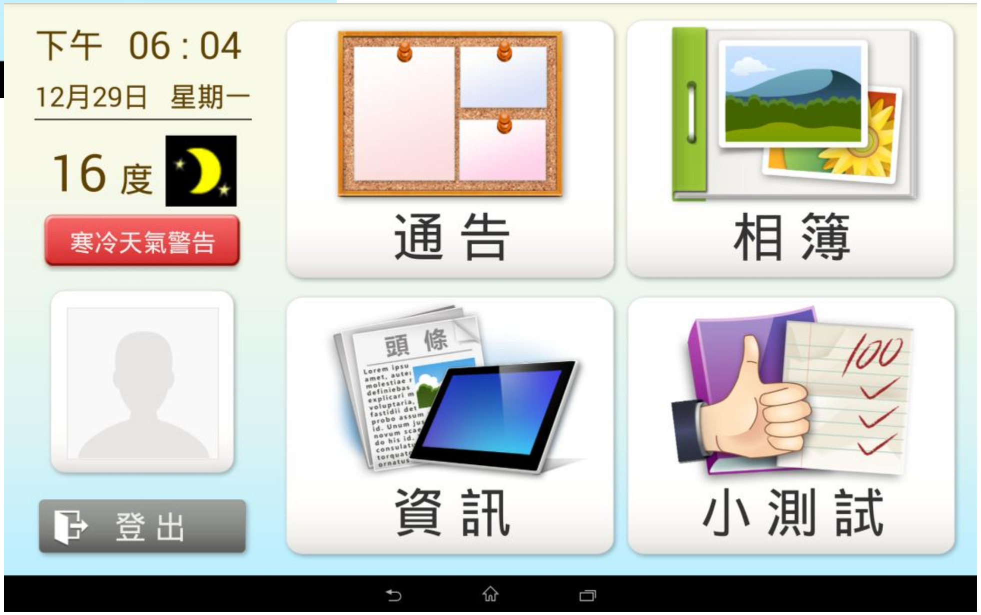
Infotainment 電子資訊及娛樂



歡迎使用社區長者資訊通

請拍卡

NFC user login
以近場通訊登入帳戶


下午 06:04
12月29日 星期一
16 度
寒冷天氣警告
通告
相簿
資訊
小測試
登出

Real-time weather warning notification
即時天氣警告

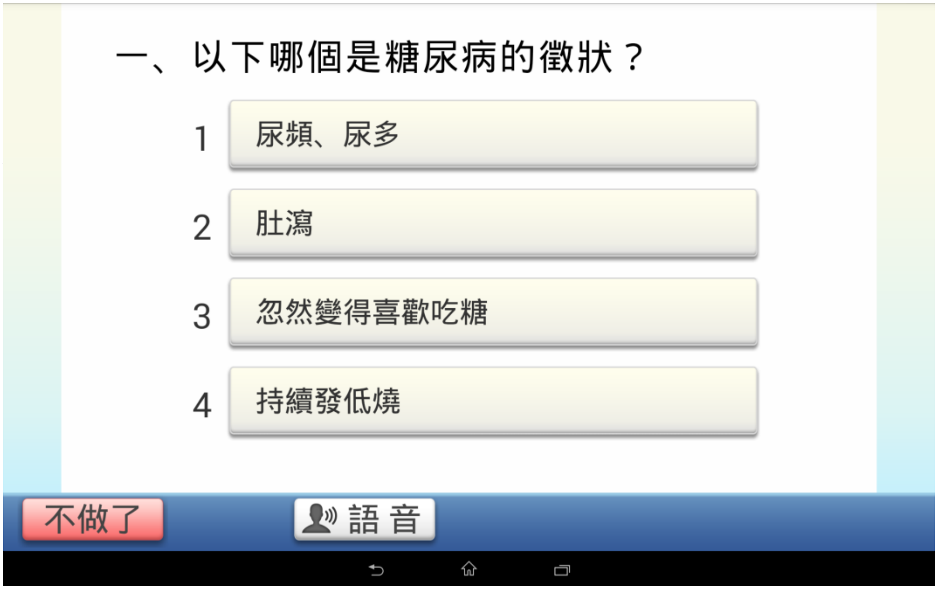
Link to newspaper apps
連結新聞應用程式

頭條日報

am730

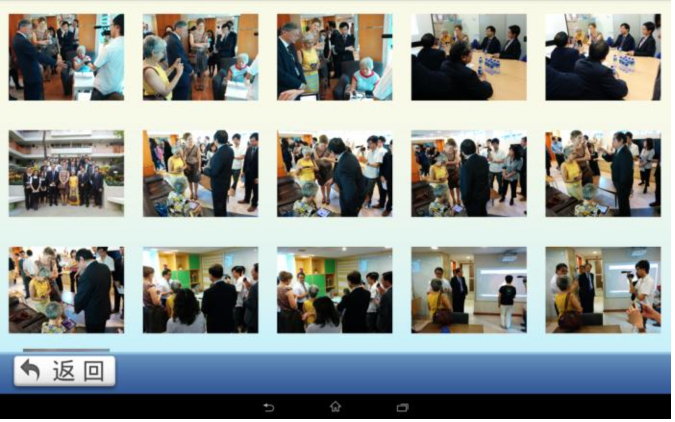
Interactive Content 互動資訊

Quiz for knowledge level assessment
小測試作知識水平評

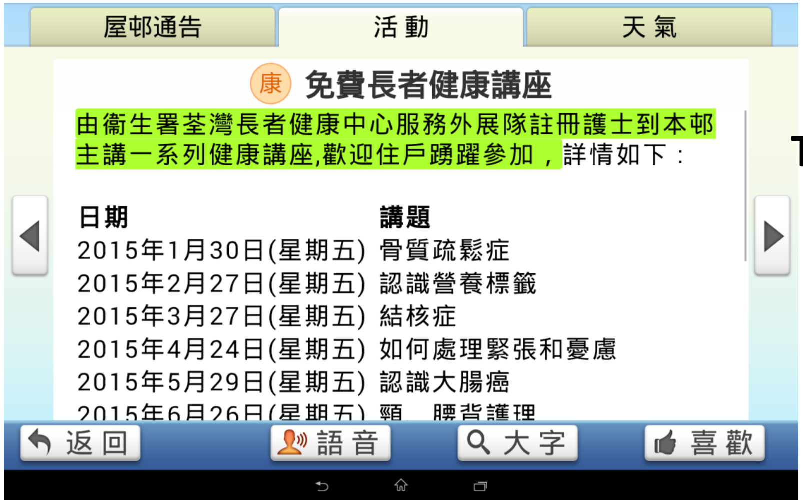


一、以下哪個是糖尿病的徵狀？

1 尿頻、尿多
2 肚瀉
3 忽然變得喜歡吃糖
4 持續發低燒



Online photo album
線上相簿



康 **免費長者健康講座**

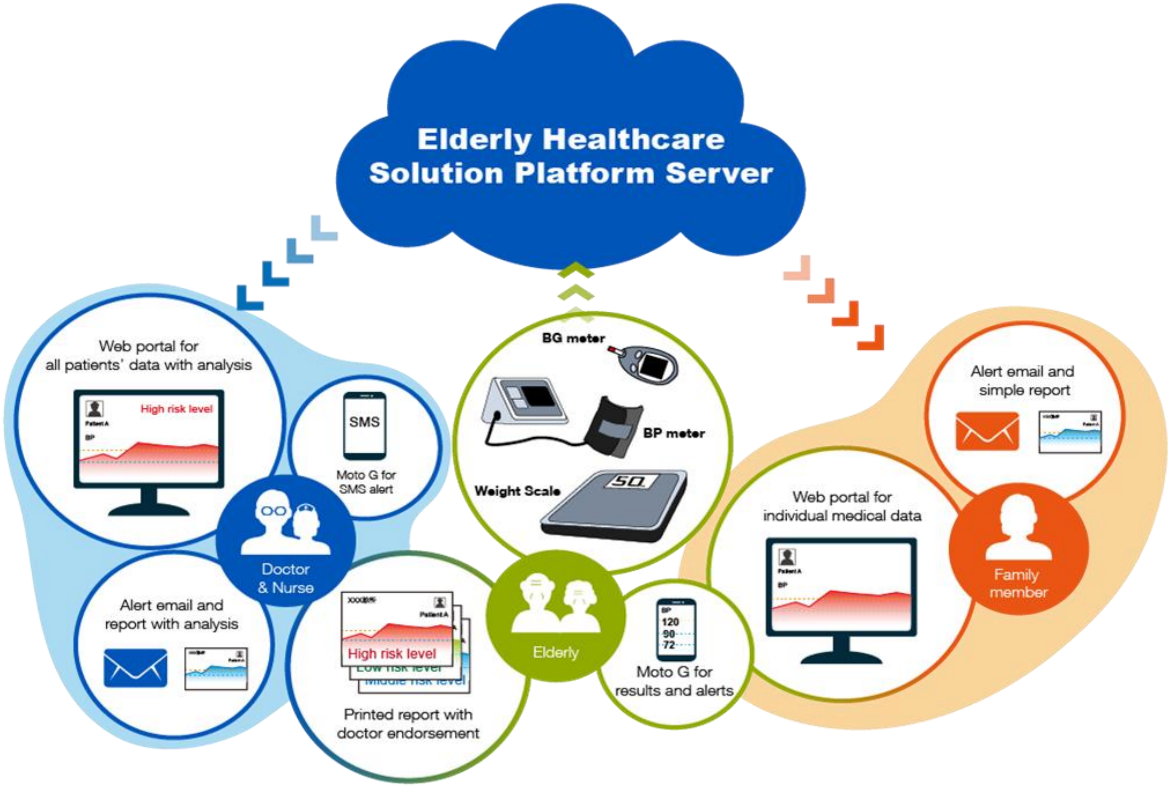
由衛生署荃灣長者健康中心服務外展隊註冊護士到本邨主講一系列健康講座，歡迎住戶踴躍參加，詳情如下：

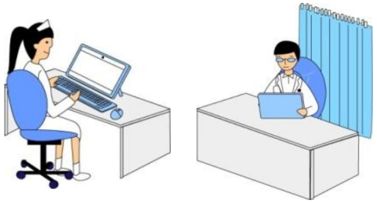
日期	**講題**
2015年1月30日(星期五)	骨質疏鬆症
2015年2月27日(星期五)	認識營養標籤
2015年3月27日(星期五)	結核症
2015年4月24日(星期五)	如何處理緊張和憂慮
2015年5月29日(星期五)	認識大腸癌
2015年6月26日(星期五)	頸、腰背護理

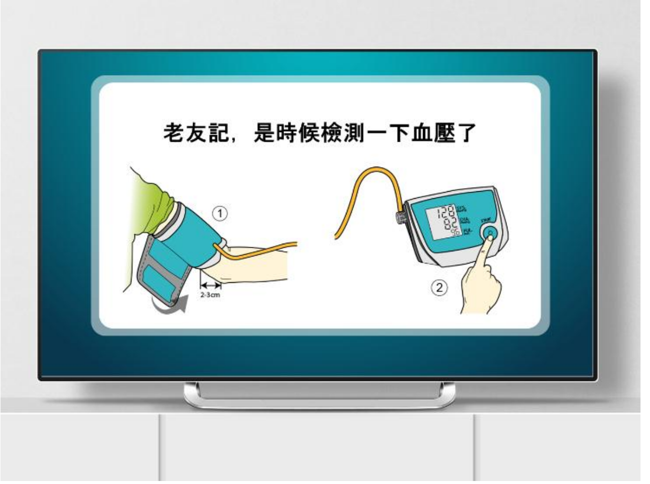
Text-to-speech technology
文字轉語音輸出技術

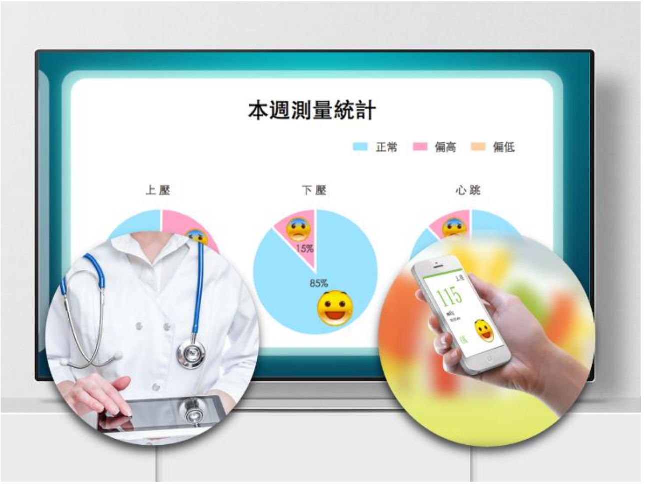
Health care anywhere anytime

Cloud base health care solution

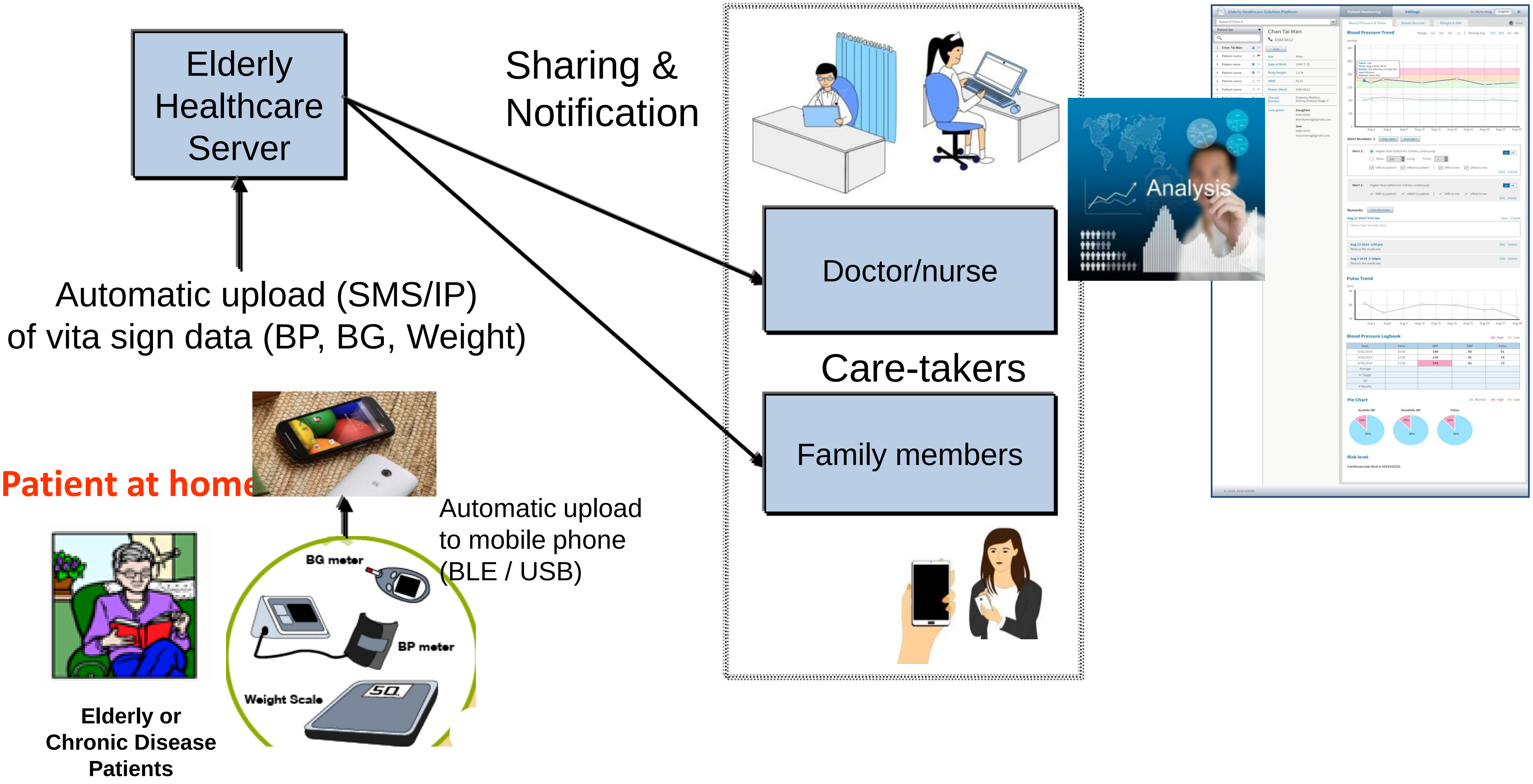

Elderly Healthcare
Solution Platform Server
Web portal for
all patients' data with analysis
High risk level
SMS
Moto G for
SMS alert
Doctor
& Nurse
Alert email and
report with analysis
High risk level
Low risk level
Middle risk level
Printed report with
doctor endorsement
BG meter
BP meter
Weight Scale
50
Elderly
BP
120
90
72
Moto G for
results and alerts
Web portal for
individual medical data
Alert email and
simple report
Family
member




老友記，是時候檢測一下血壓了
①
②
2-3cm



ASTRI Elderly Healthcare Solution Platform



Elderly Healthcare Server

Sharing & Notification

Automatic upload (SMS/IP)
of vita sign data (BP, BG, Weight)

Doctor/nurse

Care-takers

Family members

Patient at home

Automatic upload
to mobile phone
(BLE / USB)

Elderly or Chronic Disease Patients

Analysis
BG meter
BP meter
Weight Scale
50

Elderly Healthcare Solution Platform | Patient Monitoring | Settings | Dr. Ma Ka Wing | Logout

Name of Clinin A

Patient list

1 Chan Tai Man
2 Patient name
3 Patient name
4 Patient name
5 Patient name
6 Patient name

Chan Tai Man
6584 8612
Edit

Sex	Male
Date of Birth	1940-7-15
Body Height	1.6 M
HKID	A123
Phone (Alert)	6584 8612
Chronic Disease	Diabetes Mellitus Kidney Disease Stage 3
Care givers	Daughter 6565 6545 Mandywong@gmail.com Son 6565 6545 Victorwong@gmail.com

Blood Pressure & Pulse | Blood Glucose | Weight & BMI | Print

Blood Pressure Trend

Range: 1w 1m 3m 1y | Moving Avg: 10d 20d 3m No

Value: 140
Time: Aug 2 2014 09:53
Doctor: Pay attention to high risk heart disease.
Patient: Salty diet.

mmHg
240
200
160
120
80
40
0
Aug 3
Aug 6
Aug 9
Aug 12
Aug 15
Aug 18
Aug 21
Aug 24
Aug 27
Aug 30

Alert Number: 1 | Hide Alert | Add alert

Alert 2: ● Higher than before for 3 times continously
○ Value 160 mmHg Times 1
☑ SMS to patient ☑ eMail to patient | ☑ SMS to me ☑ eMail to me
on off
Save Cancel

Alert 1: Higher than before for 3 times continously
✓ SMS to patient ✓ eMail to patient | ✓ SMS to me ✓ eMail to me
on off
Edit Delete

Remarks | Hide Remarks

Aug 21 2014 9:53 am — Save Cancel
Please type remarks here.

Aug 13 2014 1:50 pm — Edit Delete
Reduce the medicine.

Aug 3 2014 2:00pm — Edit Delete
Reduce the medicine.

Pulse Trend

bpm
90
80
70
Aug 3
Aug 6
Aug 9
Aug 12
Aug 15
Aug 18
Aug 21
Aug 24
Aug 27
Aug 30

Blood Pressure Logbook

🟥 High 🟧 Low

Date	Time	SBP	DBP	Pulse
8/02/2014	10:00	140	90	81
8/03/2014	12:20	138	91	78
8/06/2014	11:56	142	92	73
Average				
In Target				
SD				
# Results				

Pie Chart

🟦 Normal 🟥 High 🟧 Low

Systolic BP
15%
85%
Doastolic BP
15%
85%
Pulse
15%
85%

Risk level

Cardiovascular Risk is $$$$$$$$$$

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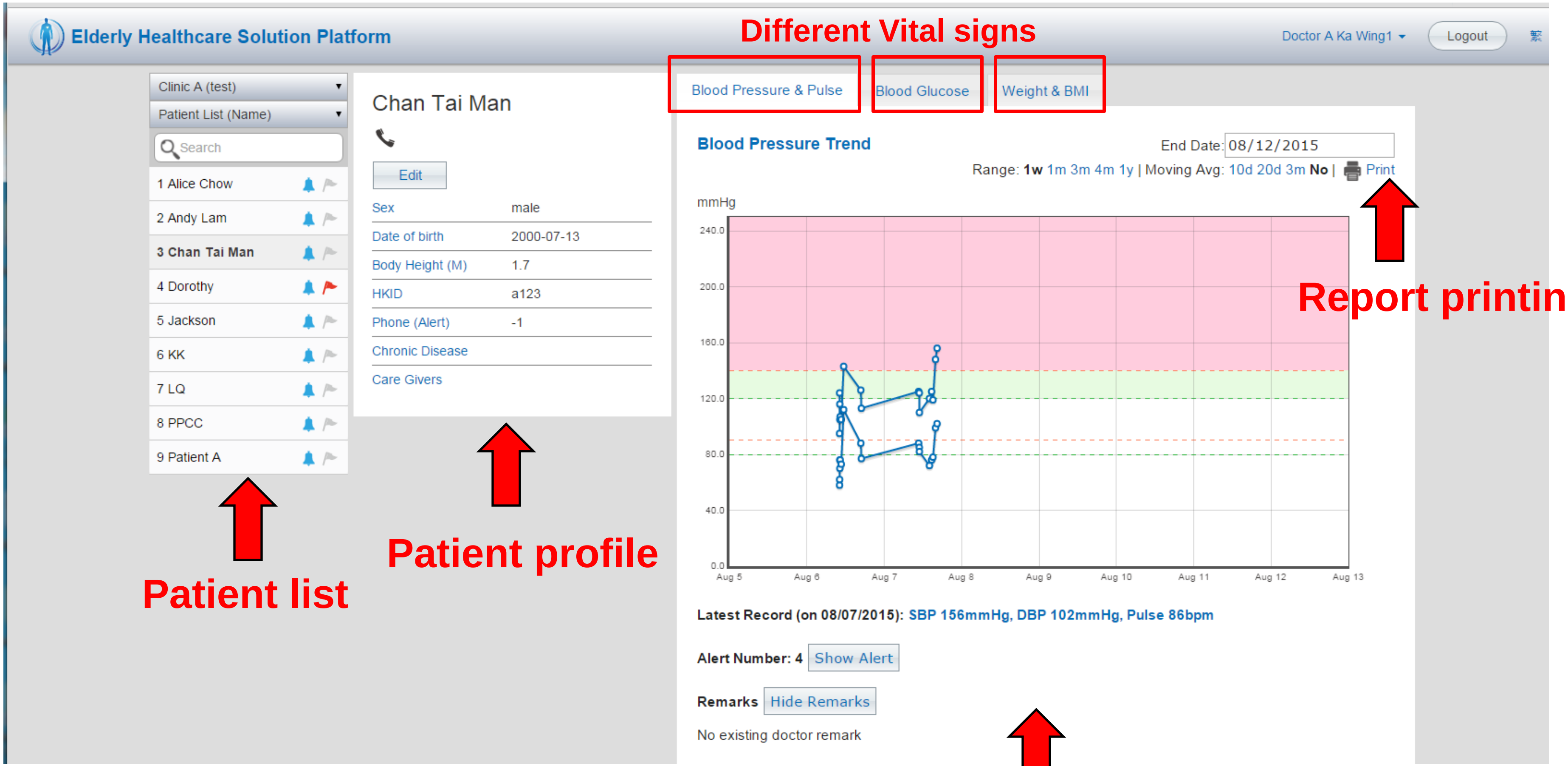
EHSP Web Portal: Basic Features


Elderly Healthcare Solution Platform
Doctor A Ka Wing1
Logout
繁
Clinic A (test)
Patient List (Name)
Search
Edit
Blood Pressure & Pulse
Blood Glucose
Weight & BMI
Print
mmHg
240.0
200.0
160.0
120.0
80.0
40.0
0.0
Aug 5
Aug 6
Aug 7
Aug 8
Aug 9
Aug 10
Aug 11
Aug 12
Aug 13
Show Alert
Hide Remarks

1 Alice Chow
2 Andy Lam
3 Chan Tai Man
4 Dorothy
5 Jackson
6 KK
7 LQ
8 PPCC
9 Patient A

Chan Tai Man

Sex	male
Date of birth	2000-07-13
Body Height (M)	1.7
HKID	a123
Phone (Alert)	-1
Chronic Disease	
Care Givers	

Blood Pressure Trend

End Date: 08/12/2015

Range: **1w** 1m 3m 4m 1y | Moving Avg: 10d 20d 3m **No** | Print

Latest Record (on 08/07/2015): **SBP 156mmHg, DBP 102mmHg, Pulse 86bpm**

Alert Number: 4 Show Alert

Remarks Hide Remarks

No existing doctor remark

Different Vital signs

Report printing

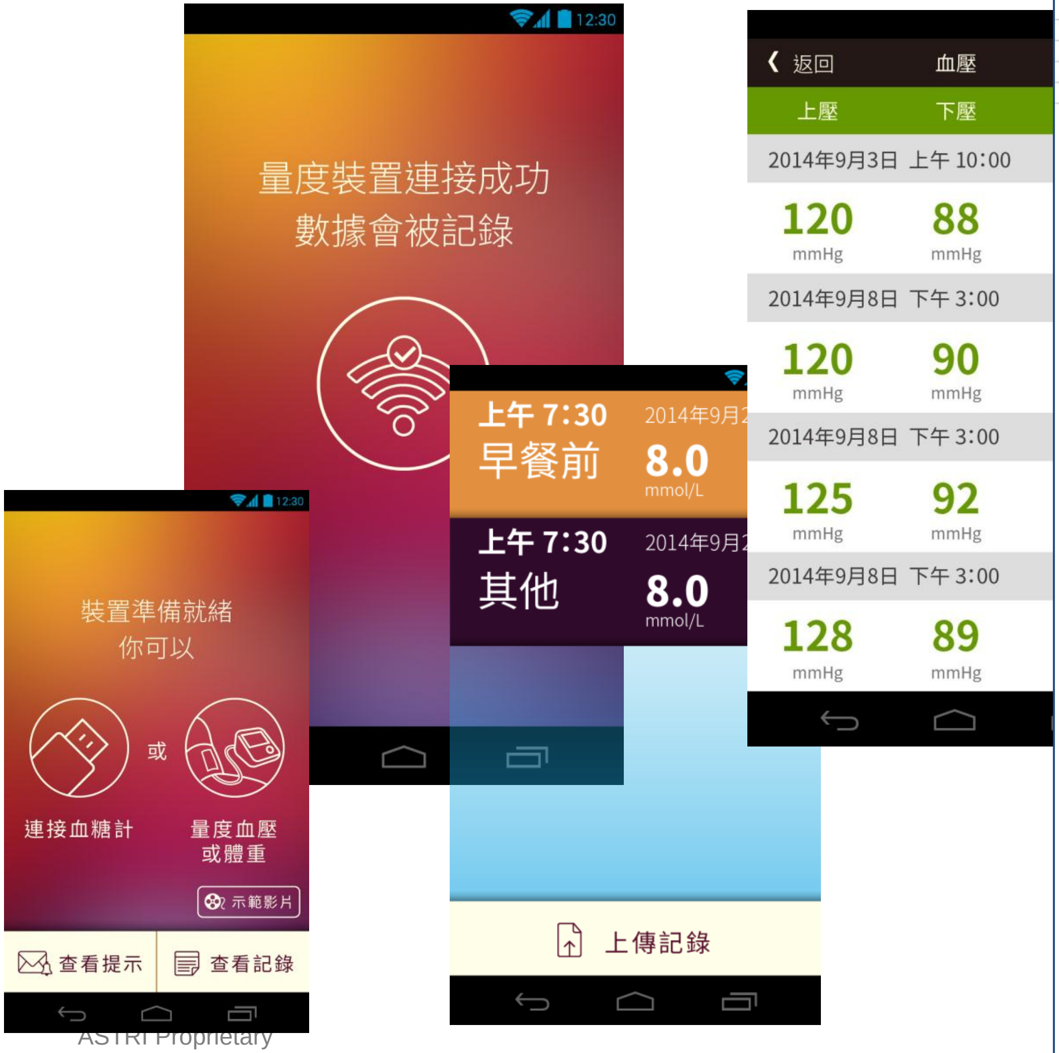
Patient list

Patient profile

Data record & analysis

Wellness data analytics

Preventive health care



12:30

量度裝置連接成功
數據會被記錄

12:30

裝置準備就緒
你可以

連接血糖計

或

量度血壓
或體重

示範影片

查看提示

查看記錄

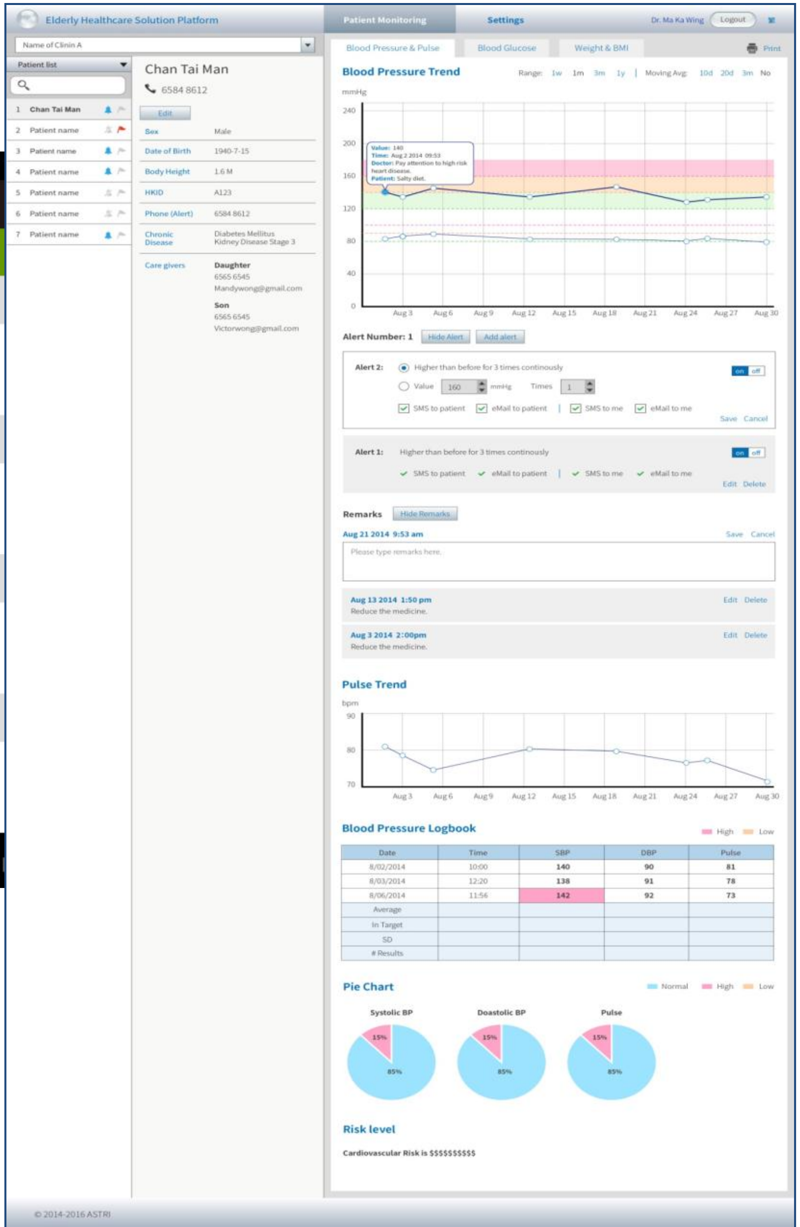
上午 7:30 2014年9月2
早餐前 8.0 mmol/L

上午 7:30 2014年9月2
其他 8.0 mmol/L

上傳記錄

返回　血壓

上壓	下壓
2014年9月3日 上午 10:00	
120 mmHg	88 mmHg
2014年9月8日 下午 3:00	
120 mmHg	90 mmHg
2014年9月8日 下午 3:00	
125 mmHg	92 mmHg
2014年9月8日 下午 3:00	
128 mmHg	89 mmHg



Elderly Healthcare Solution Platform

Patient Monitoring　Settings　Dr. Ma Ka Wing　Logout

Name of Clinin A

Patient list

1 Chan Tai Man
2 Patient name
3 Patient name
4 Patient name
5 Patient name
6 Patient name
7 Patient name

Chan Tai Man
☎ 6584 8612
Edit

Sex	Male
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Blood Pressure & Pulse　Blood Glucose　Weight & BMI　Print

Blood Pressure Trend

Range: 1w 1m 3m 1y | Moving Avg: 10d 20d 3m No

mmHg
240
200
160
120
80
40
0
Aug 3
Aug 6
Aug 9
Aug 12
Aug 15
Aug 18
Aug 21
Aug 24
Aug 27
Aug 30

Value: 140
Time: Aug 2 2014 09:53
Doctor: Pay attention to high risk heart disease.
Patient: Salty diet.

Alert Number: 1　Hide Alert　Add alert

Alert 2: ● Higher than before for 3 times continously　on off
○ Value 160 mmHg　Times 1
☑ SMS to patient　☑ eMail to patient | ☑ SMS to me　☑ eMail to me
Save　Cancel

Alert 1: Higher than before for 3 times continously　on off
✓ SMS to patient　✓ eMail to patient | ✓ SMS to me　✓ eMail to me
Edit　Delete

Remarks　Hide Remarks

Aug 21 2014 9:53 am　Save　Cancel
Please type remarks here.

Aug 13 2014 1:50 pm　Edit　Delete
Reduce the medicine.

Aug 3 2014 2:00pm　Edit　Delete
Reduce the medicine.

Pulse Trend

bpm
90
80
70
Aug 3
Aug 6
Aug 9
Aug 12
Aug 15
Aug 18
Aug 21
Aug 24
Aug 27
Aug 30

Blood Pressure Logbook　🟥 High　🟧 Low

Date	Time	SBP	DBP	Pulse
8/02/2014	10:00	**140**	**90**	**81**
8/03/2014	12:20	**138**	**91**	**78**
8/06/2014	11:56	**142**	**92**	**73**
Average				
In Target				
SD				
# Results				

Pie Chart

Normal
High
Low
Systolic BP
15%
85%
Doastolic BP
15%
85%
Pulse
15%
85%

Risk level

Cardiovascular Risk is $$$$$$$$$$

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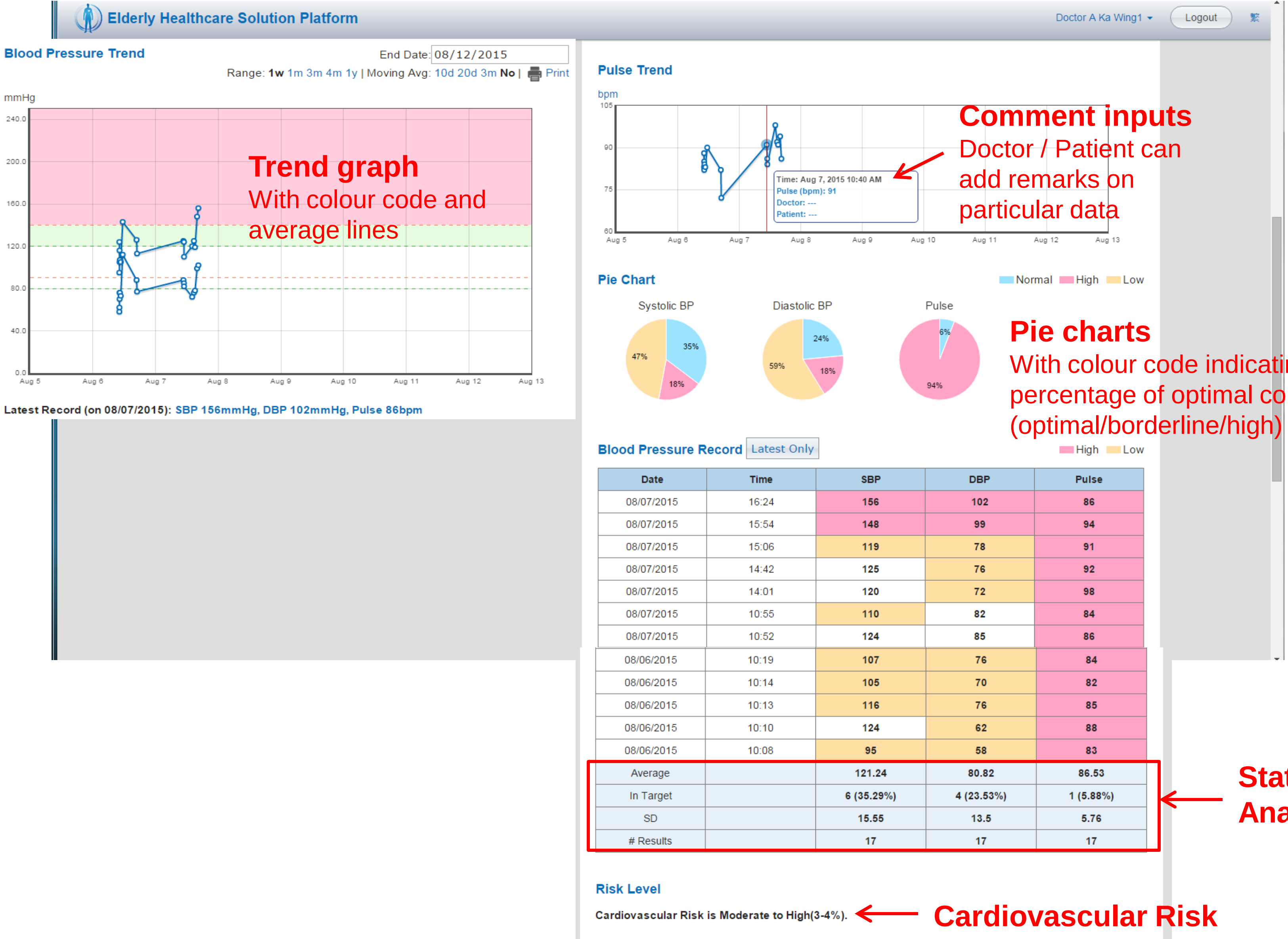
EHSP Web Portal: Statistical Analysis & Risk Level



Elderly Healthcare Solution Platform
Doctor A Ka Wing1 ▾
Logout
繁

Blood Pressure Trend

End Date: 08/12/2015

Range: **1w** 1m 3m 4m 1y | Moving Avg: 10d 20d 3m **No** | Print

mmHg
240.0
200.0
160.0
120.0
80.0
40.0
0.0
Aug 5
Aug 6
Aug 7
Aug 8
Aug 9
Aug 10
Aug 11
Aug 12
Aug 13

Trend graph
With colour code and average lines

Latest Record (on 08/07/2015): SBP 156mmHg, DBP 102mmHg, Pulse 86bpm

Pulse Trend

bpm
105
90
75
60
Aug 5
Aug 6
Aug 7
Aug 8
Aug 9
Aug 10
Aug 11
Aug 12
Aug 13

Time: Aug 7, 2015 10:40 AM
Pulse (bpm): 91
Doctor: ---
Patient: ---

Comment inputs
Doctor / Patient can add remarks on particular data

Pie Chart

🟦 Normal 🟥 High 🟨 Low

Systolic BP
35%
18%
47%
Diastolic BP
24%
18%
59%
Pulse
6%
94%

Pie charts
With colour code indicating percentage of optimal control (optimal/borderline/high)

Blood Pressure Record Latest Only

🟥 High 🟨 Low

Date	Time	SBP	DBP	Pulse
08/07/2015	16:24	156	102	86
08/07/2015	15:54	148	99	94
08/07/2015	15:06	119	78	91
08/07/2015	14:42	125	76	92
08/07/2015	14:01	120	72	98
08/07/2015	10:55	110	82	84
08/07/2015	10:52	124	85	86
08/06/2015	10:19	107	76	84
08/06/2015	10:14	105	70	82
08/06/2015	10:13	116	76	85
08/06/2015	10:10	124	62	88
08/06/2015	10:08	95	58	83
Average		121.24	80.82	86.53
In Target		6 (35.29%)	4 (23.53%)	1 (5.88%)
SD		15.55	13.5	5.76
# Results		17	17	17

Statistical Analysis

Risk Level

Cardiovascular Risk is Moderate to High(3-4%).

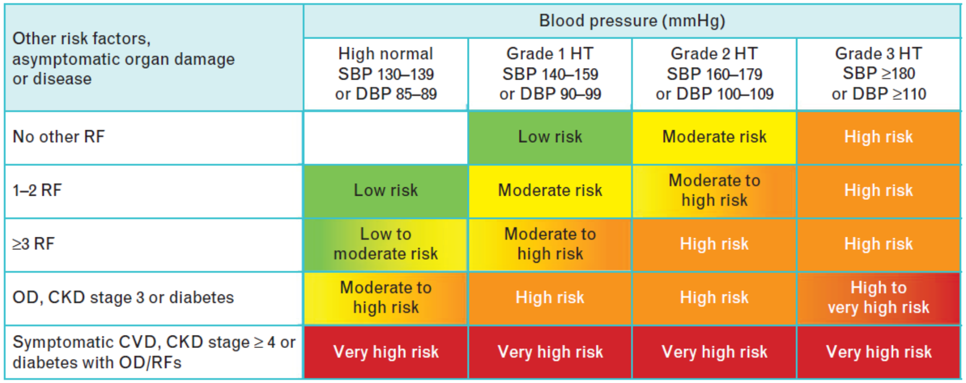
Cardiovascular Risk
Calculation algorithm based on 2013 ESH/ESC Guidelines

EHSP Web Portal: Risk Level Calculation

Guidelines & Rules + Patient’s Individual Characteristics + Patient’s Vital Sign Data

Risk Level Calculation Algorithm based on

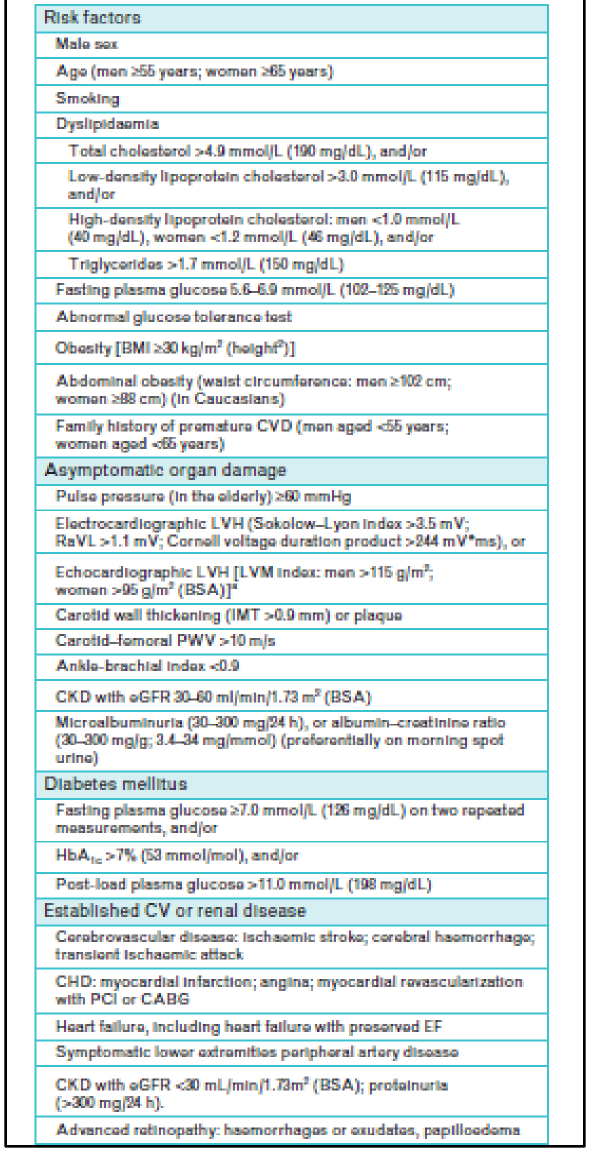
- 2013 ESH/ESC Guidelines for the management of arterial hypertension (European Society of Hypertension/Cardiology)
- Patient’s health condition profile counting as Risk Factors
- Patient’s vital sign data collected by ASTRI EHSP system



Other risk factors, asymptomatic organ damage or disease	Blood pressure (mmHg)			
	High normal SBP 130–139 or DBP 85–89	Grade 1 HT SBP 140–159 or DBP 90–99	Grade 2 HT SBP 160–179 or DBP 100–109	Grade 3 HT SBP ≥180 or DBP ≥110
No other RF		Low risk	Moderate risk	High risk
1–2 RF	Low risk	Moderate risk	Moderate to high risk	High risk
≥3 RF	Low to moderate risk	Moderate to high risk	High risk	High risk
OD, CKD stage 3 or diabetes	Moderate to high risk	High risk	High risk	High to very high risk
Symptomatic CVD, CKD stage ≥ 4 or diabetes with OD/RFs	Very high risk	Very high risk	Very high risk	Very high risk

BP = blood pressure; CKD = chronic kidney disease; CV = cardiovascular; CVD = cardiovascular disease; DBP = diastolic blood pressure; HT = hypertension; OD = organ damage; RF = risk factor; SBP = systolic blood pressure.

FIGURE 1 Stratification of total CV risk in categories of low, moderate, high and very high risk according to SBP and DBP and prevalence of RFs, asymptomatic OD, diabetes, CKD stage or symptomatic CVD. Subjects with a high normal office but a raised out-of-office BP (masked hypertension) have a CV risk in the hypertension range. Subjects with a high office BP but normal out-of-office BP (white-coat hypertension), particularly if there is no diabetes, OD, CVD or CKD, have lower risk than sustained hypertension for the same office BP.



Risk factors
Male sex
Age (men ≥55 years; women ≥65 years)
Smoking
Dyslipidaemia
Total cholesterol >4.9 mmol/L (190 mg/dL), and/or
Low-density lipoprotein cholesterol >3.0 mmol/L (115 mg/dL), and/or
High-density lipoprotein cholesterol: men <1.0 mmol/L (40 mg/dL), women <1.2 mmol/L (46 mg/dL), and/or
Triglycerides >1.7 mmol/L (150 mg/dL)
Fasting plasma glucose 5.6–6.9 mmol/L (102–125 mg/dL)
Abnormal glucose tolerance test
Obesity [BMI ≥30 kg/m^2 (height^2)]
Abdominal obesity (waist circumference: men ≥102 cm; women ≥88 cm) (in Caucasians)
Family history of premature CVD (men aged <55 years; women aged <65 years)
Asymptomatic organ damage
Pulse pressure (in the elderly) ≥60 mmHg
Electrocardiographic LVH (Sokolow–Lyon index >3.5 mV; RaVL >1.1 mV; Cornell voltage duration product >244 mV*ms), or
Echocardiographic LVH [LVM index: men >115 g/m^2; women >95 g/m^2 (BSA)]^a
Carotid wall thickening (IMT >0.9 mm) or plaque
Carotid–femoral PWV >10 m/s
Ankle-brachial index <0.9
CKD with eGFR 30–60 ml/min/1.73 m^2 (BSA)
Microalbuminuria (30–300 mg/24 h), or albumin–creatinine ratio (30–300 mg/g; 3.4–34 mg/mmol) (preferentially on morning spot urine)
Diabetes mellitus
Fasting plasma glucose ≥7.0 mmol/L (126 mg/dL) on two repeated measurements, and/or
HbA$_{1c}$ >7% (53 mmol/mol), and/or
Post-load plasma glucose >11.0 mmol/L (198 mg/dL)
Established CV or renal disease
Cerebrovascular disease: ischaemic stroke; cerebral haemorrhage; transient ischaemic attack
CHD: myocardial infarction; angina; myocardial revascularization with PCI or CABG
Heart failure, including heart failure with preserved EF
Symptomatic lower extremities peripheral artery disease
CKD with eGFR <30 mL/min/1.73m^2 (BSA); proteinuria (>300 mg/24 h).
Advanced retinopathy: haemorrhages or exudates, papilloedema

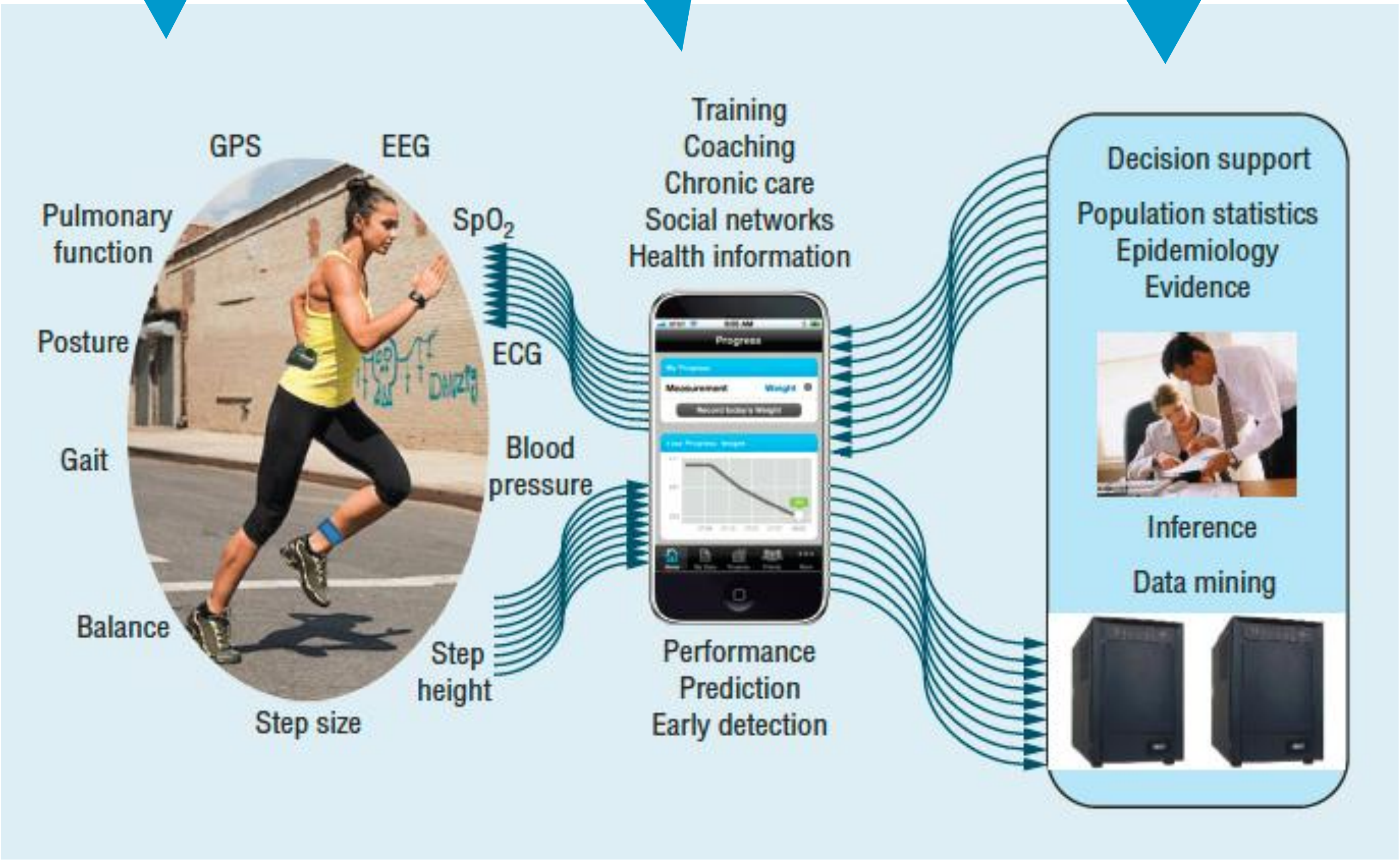
Risk Level	Possibility of Cardiovascular Events in 10 Years
Minimal	N/A
Low	< 1%
Moderate	2%
Moderate to High	3 – 4%
High	5 – 10%
High to Very High	> 10%
Very High	> 15%

Healthcare and Wellness

Device, Sensing Module

Mobile Computing Personal Analytic; Gateway to service provider

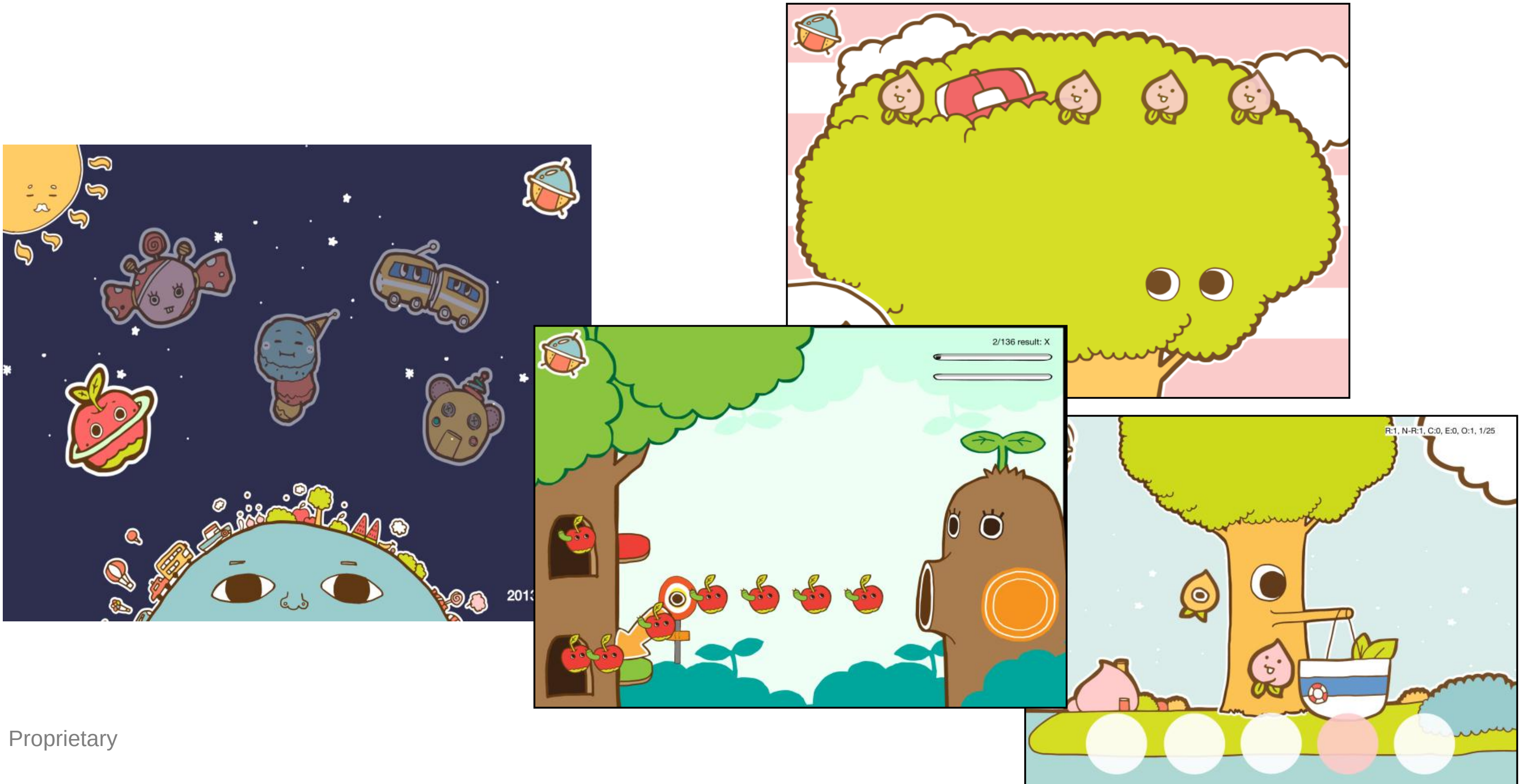
Cloud level Big Data Analytic Service provider; Global statistics


GPS
EEG
Pulmonary function
SpO$_2$
Posture
ECG
Gait
Blood pressure
Balance
Step height
Step size
Training
Coaching
Chronic care
Social networks
Health information
Performance
Prediction
Early detection
Decision support
Population statistics
Epidemiology
Evidence
Inference
Data mining

Example for service + technologies

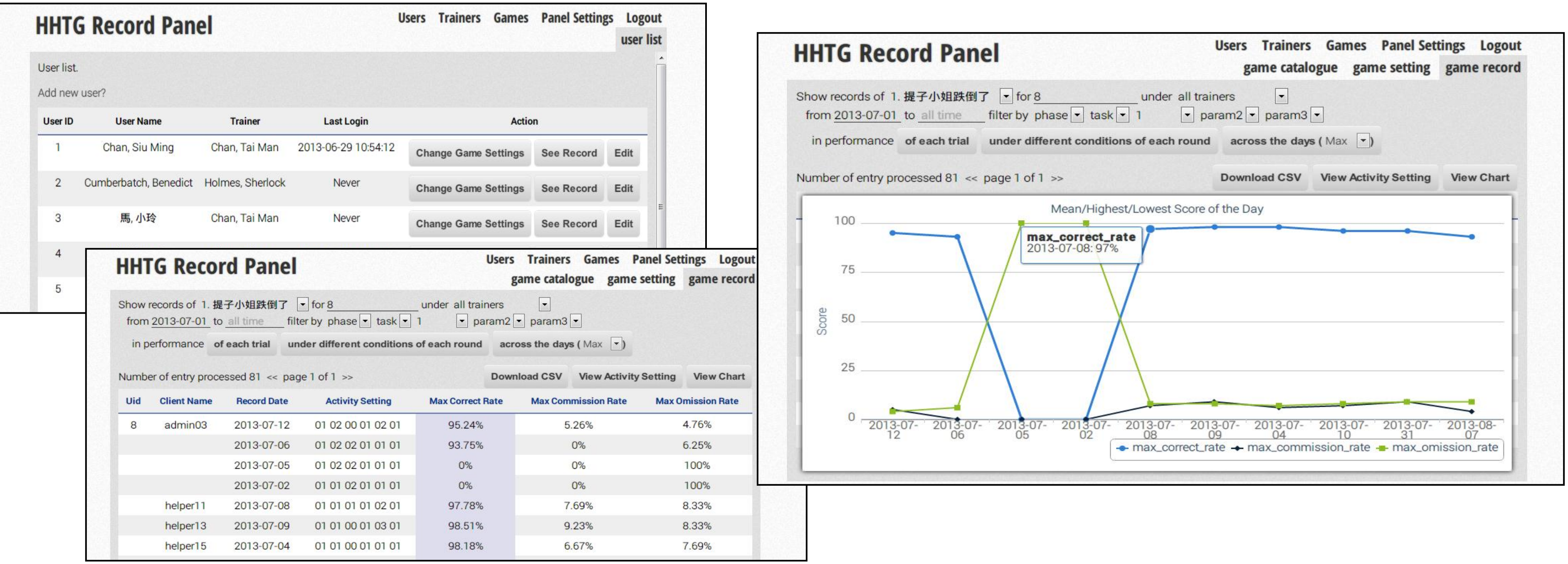
For special need children such as ADHD, learning and writing difficulties

From “face to face” to have more data collection at home and outside, and more analysis


2013
2/136 result: X
R:1, N-R:1, C:0, E:0, O:1, 1/25

Data analytics

- Children behavior and action data transfer to server, optional with heart beat rate sensor
- Trainer / psychologist for overall analysis of situation and training
- Tune the game and program accordingly



HHTG Record Panel

Users Trainers Games Panel Settings Logout
user list

User list.

Add new user?

User ID	User Name	Trainer	Last Login	Action
1	Chan, Siu Ming	Chan, Tai Man	2013-06-29 10:54:12	Change Game Settings · See Record · Edit
2	Cumberbatch, Benedict	Holmes, Sherlock	Never	Change Game Settings · See Record · Edit
3	馬, 小玲	Chan, Tai Man	Never	Change Game Settings · See Record · Edit
4				
5				

HHTG Record Panel

Show records of 1. 提子小姐跌倒了 ▾ for 8 under all trainers ▾
from 2013-07-01 to all time filter by phase ▾ task ▾ 1 ▾ param2 ▾ param3 ▾
in performance of each trial · under different conditions of each round · across the days (Max ▾)

Number of entry processed 81 << page 1 of 1 >>

Download CSV
View Activity Setting
View Chart

Uid	Client Name	Record Date	Activity Setting	Max Correct Rate	Max Commission Rate	Max Omission Rate
8	admin03	2013-07-12	01 02 00 01 02 01	95.24%	5.26%	4.76%
		2013-07-06	01 02 02 01 01 01	93.75%	0%	6.25%
		2013-07-05	01 02 02 01 01 01	0%	0%	100%
		2013-07-02	01 01 02 01 01 01	0%	0%	100%
	helper11	2013-07-08	01 01 01 01 02 01	97.78%	7.69%	8.33%
	helper13	2013-07-09	01 01 00 01 03 01	98.51%	9.23%	8.33%
	helper15	2013-07-04	01 01 00 01 01 01	98.18%	6.67%	7.69%

HHTG Record Panel

Users Trainers Games Panel Settings Logout
game catalogue game setting game record

Show records of 1. 提子小姐跌倒了 ▾ for 8 under all trainers ▾
from 2013-07-01 to all time filter by phase ▾ task ▾ 1 ▾ param2 ▾ param3 ▾
in performance of each trial · under different conditions of each round · across the days (Max ▾)

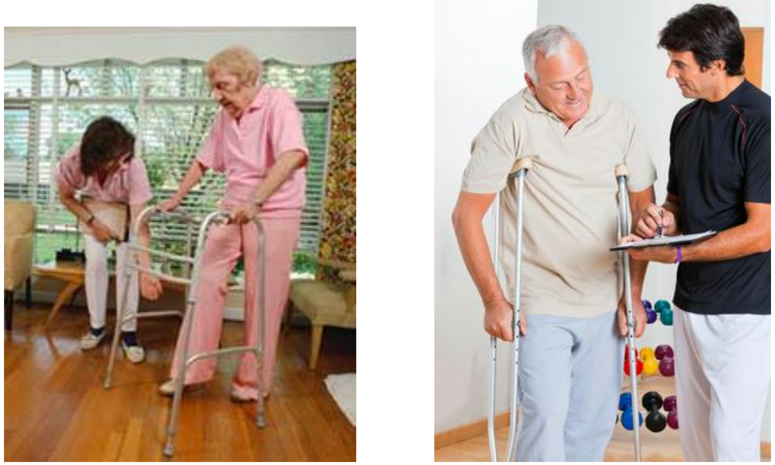
Number of entry processed 81 << page 1 of 1 >>

Download CSV View Activity Setting View Chart

Mean/Highest/Lowest Score of the Day
Score
100
75
50
25
0
max_correct_rate
2013-07-08: 97%
2013-07-12
2013-07-06
2013-07-05
2013-07-02
2013-07-08
2013-07-09
2013-07-04
2013-07-10
2013-07-31
2013-08-07
max_correct_rate
max_commission_rate
max_omission_rate

Elderly physical rehabilitation with wearable sensors

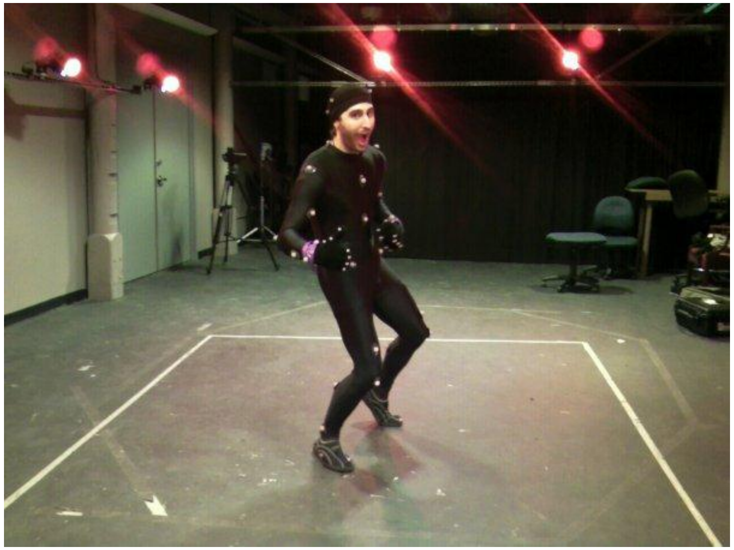
- More and more demand is required for elderly physical rehabilitation
- Involves professional advice and human resources.
- Long and critical physical rehabilitation program to recover her/his former strength, mobility and fitness.
- Physical therapist could make better treatment decisions if they had accurate patient home exercise data (self-report lack standardized and objective information)
- Lack of cost effective technology for capturing and advising motion situation

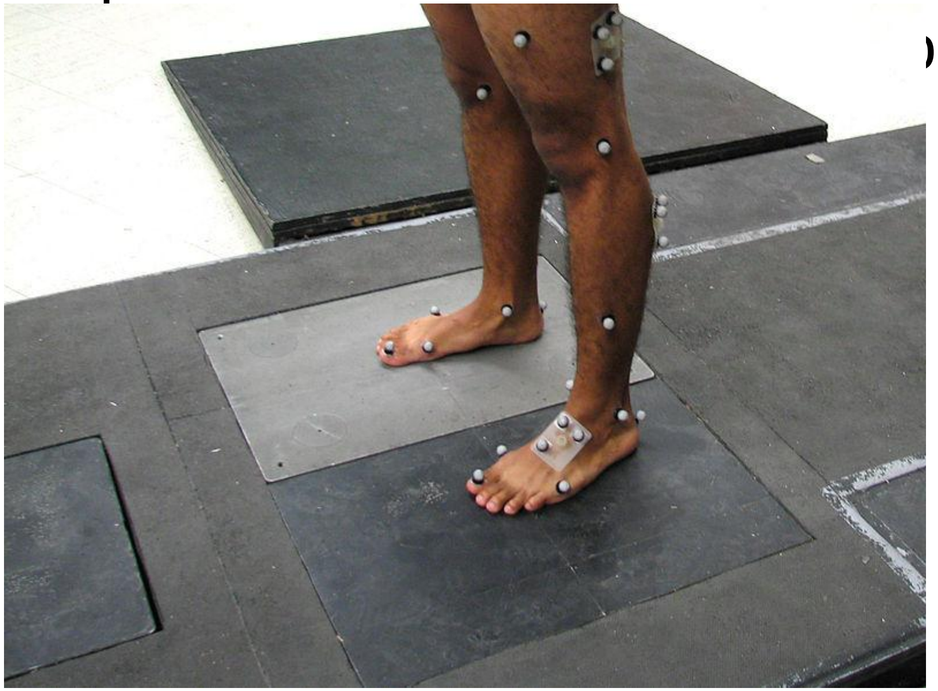


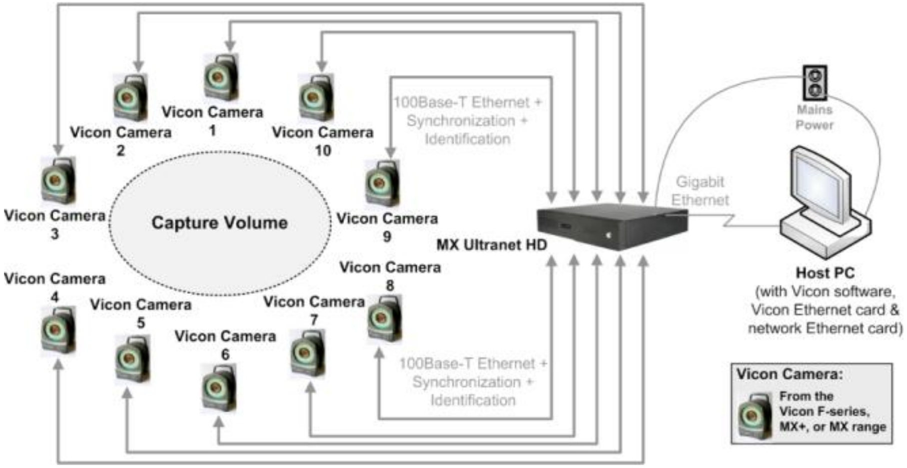
Current capture system– Multicamera capture

- Multi-camera motion capture solution
- Complicate installation in room and expensive
- Indoor special room
- Attach white ball to body key points

or

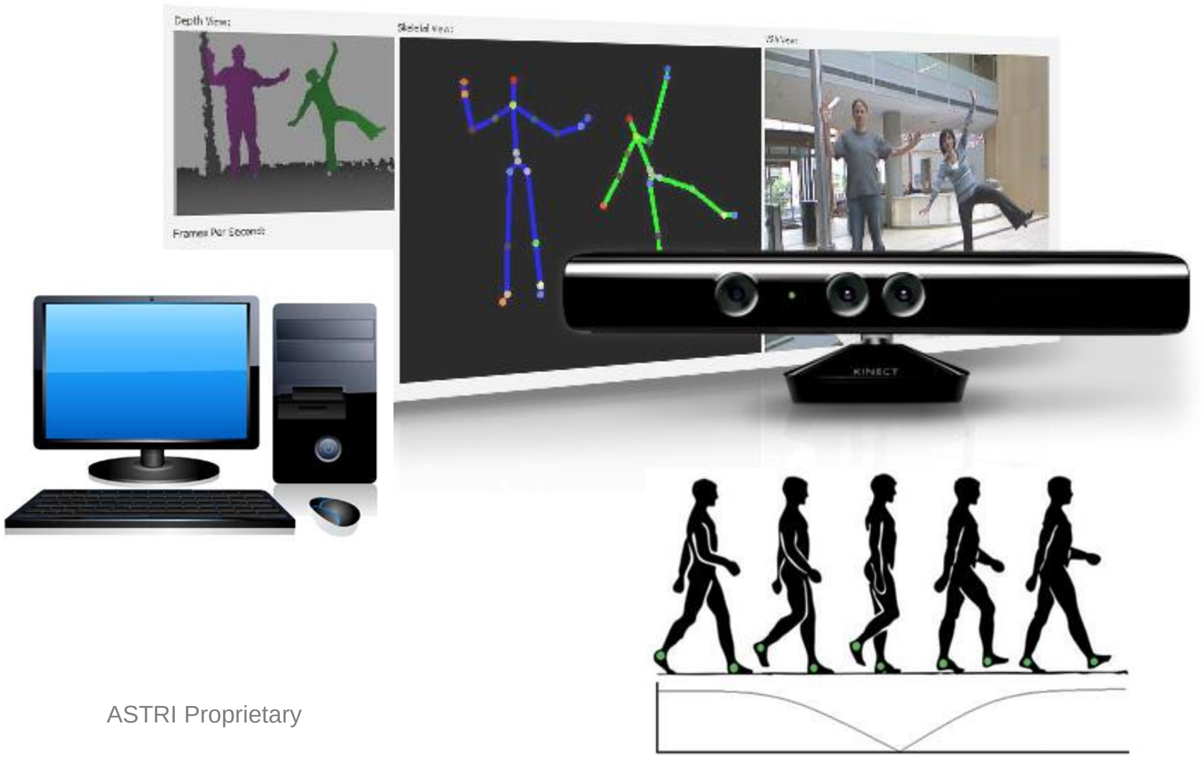





Vicon Camera 1
Vicon Camera 2
Vicon Camera 10
100Base-T Ethernet + Synchronization + Identification
Mains Power
Vicon Camera 3
Capture Volume
Vicon Camera 9
Gigabit Ethernet
MX Ultranet HD
Vicon Camera 8
Host PC (with Vicon software, Vicon Ethernet card & network Ethernet card)
Vicon Camera 4
Vicon Camera 5
Vicon Camera 7
Vicon Camera 6
100Base-T Ethernet + Synchronization + Identification
Vicon Camera: From the Vicon F-series, MX+, or MX range

Current capture system – Kinect based capture

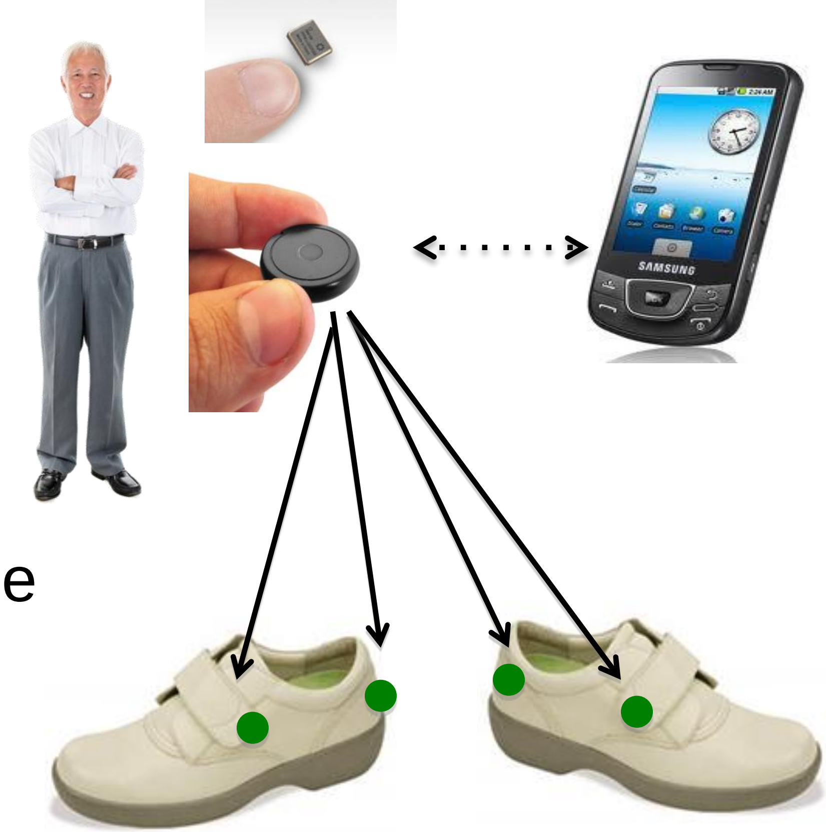
- Use low cost motion Kinect sensor for human body gesture analysis.
- The joint point positions can be obtained from the Kinect sensor and its software library in 3D space.
- larger computer and Kinect sensor on table, which is not wearable
- Distance is limited to a few meters of action range.


Depth View:
Skeletal View:
Frames Per Second:
KINECT

Ref: Use Kinect for physiotherapy, limited to 4 meters of walking

New idea for motion analysis (fall prevention)

- Wearable accelerometer and gyrosensor
- First put 2 sensors on each shoe (total 4)
- 4 wearable motion sensors for human basic walking motion capture
- Wirelessly link (Bluetooth 4.0) to smartphone
- Measurement for capture:
  - Walking distance
  - Foot to floor angle
  - Angle of 2 feet
  - Rhythm of steps
  - Walking style
  - …
- Data visualization in smartphone
- Expert advices from physical therapists



End of Presentation

Thank you. Questions are welcome.

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