TimePeace
Cognitive Assistance Technology

Applied to time & location
Using a Raspberry Pi
To offer reassurance in the early stages of Alzheimer's disease

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Presentation to "Raspberry Pint London"
29th November 2016 by David Penney

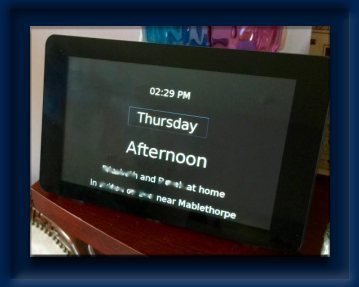
Definition:
Cognitive Assistance Technology

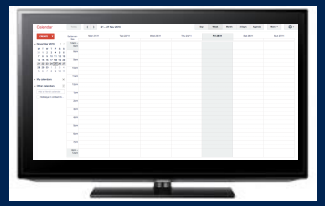
"use of technology (usually high tech) to augment and assist cognitive processes such as attention, **memory**, self-regulation, navigation, emotion recognition and management, planning, and sequencing activity"

Source: LoPresti, E.F., Mihailidis, A. & Kirsch, N. (2004).
Assistive Technology for cognitive rehabilitation: State of the art.
Neuropsychological Rehabilitation, 14, 5-39

3 projects to reassure a relative diagnosed with early stage Alzheimer's disease

- TimePeace
  clock shows time of day
  & day of week
- AlexaPi
  ask who is visiting
- CalendarTV
  see who is visiting

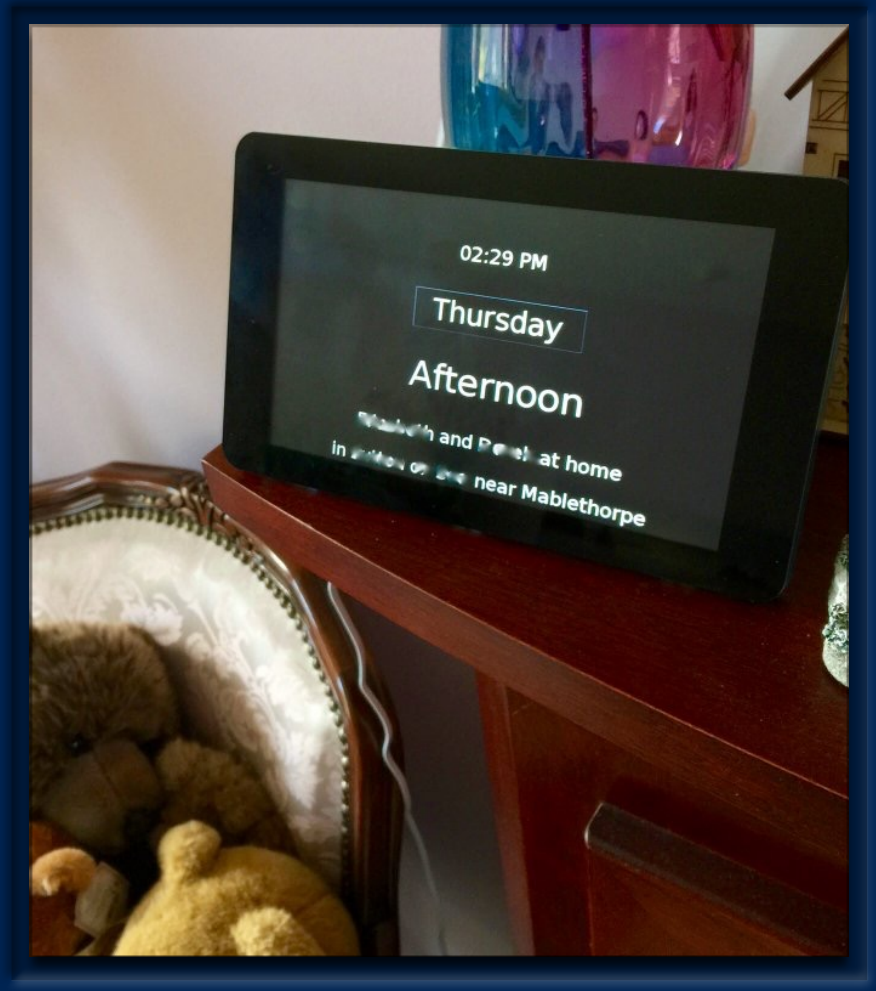




What is TimePeace?

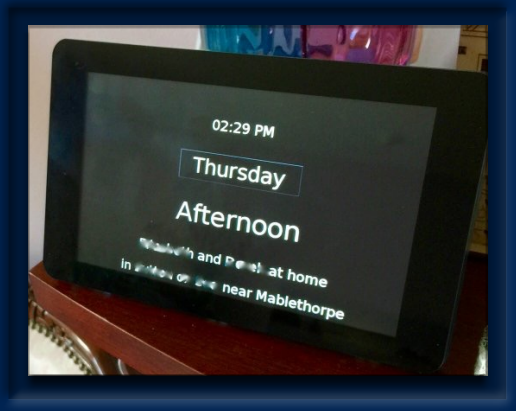
It’s a straightforward clock

Made specifically to reassure a person with Alzheimer’s disease



Elizabeths' Requirements

- **Alzheimer's can disconnect people from time, location (places) & identity (people)**
  - It becomes impossible to remember the day of the week for more than a few minutes
  - But the emotion of bothering someone is remembered & mounts
  - An hour can feel like a day
    or a week feel like it passed in a few minutes
  - It can also be difficult to know if its morning, evening or middle of the night
  - Can also disconnect from identity & location
- **So a clock must:**
  - Show the day of the week
  - Show the time of day
  - Reinforce location
  - Not be too bright at night
  - Be straightforward to use

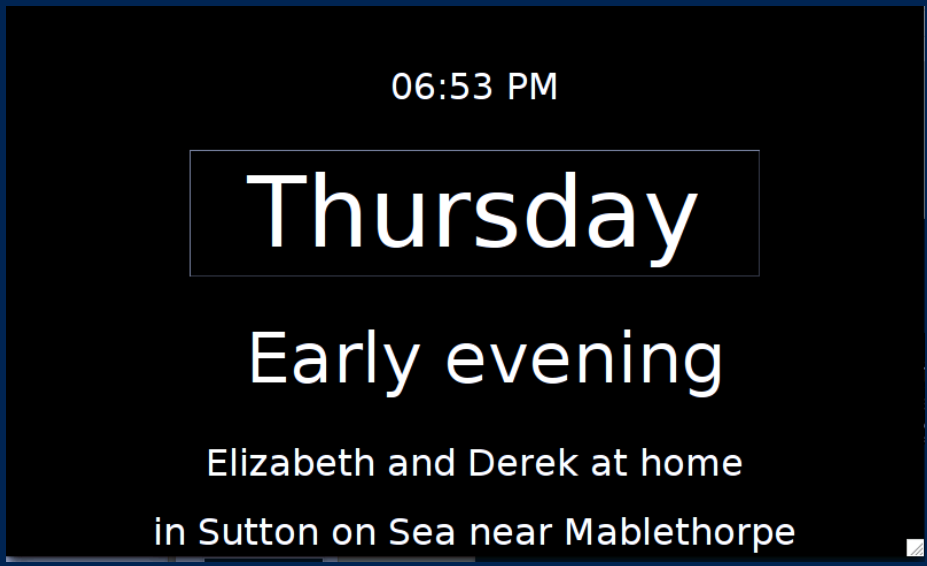


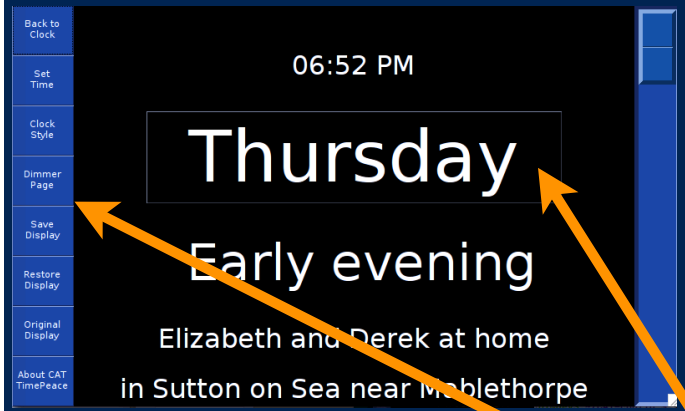
Of course with Unix / Raspbian
nothing straightforward is easy

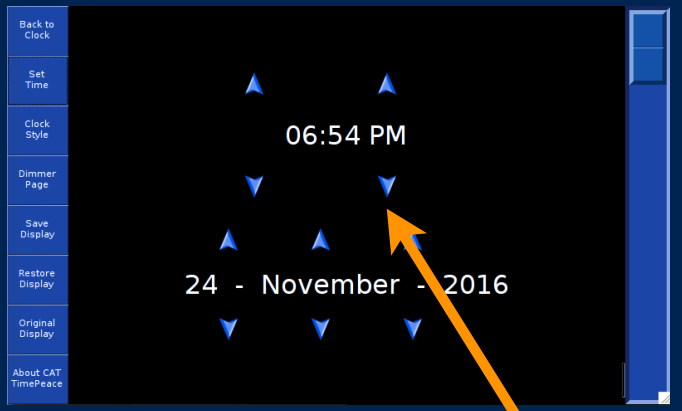
Straightforward
- like cute -
is a lot of work!

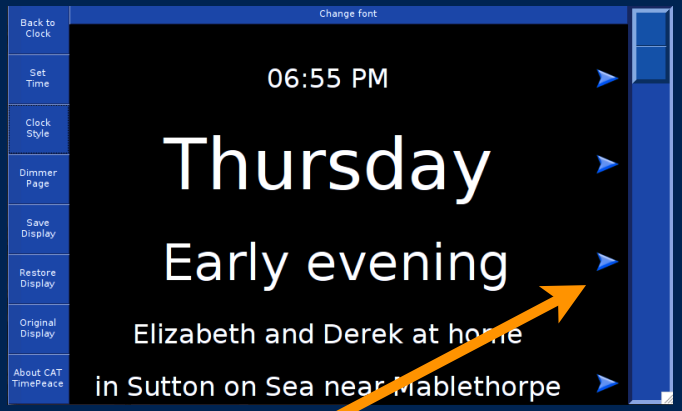
There are a number of screens

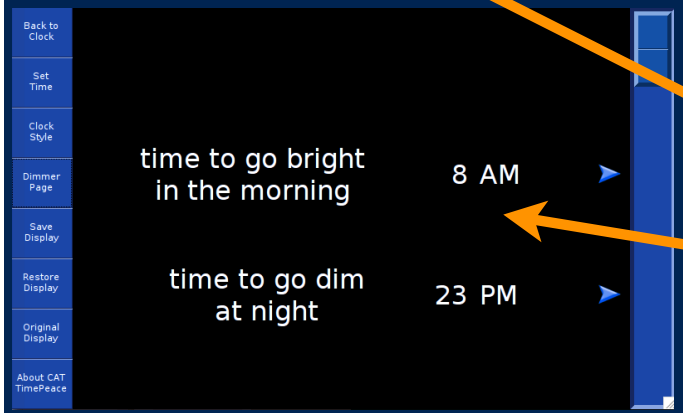
But no buttons!



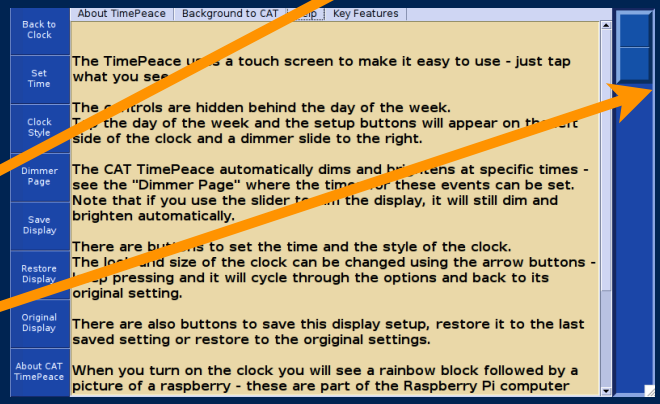








Tap the day to turn on a menu
Menu to choose screen etc
Tap arrows to change time/date
Cycle through fonts & sizes
Change time to fade at night & light up the morning
Use slider to dim & brighten



What is it made from?

- RASClock (RTC)
  - Afterthought Software
- Raspberry Pi 2 or 3
  - Raspberry Pi Foundation
- 7” TouchScreen
  - Raspberry Pi Foundation
- Case
  - ModMyPi
- Software
  - Python, Shell scripts
  - Raspbian Jessie configuration changes

Plus code & configuration

- 1200 lines of Python
  tkinter, time, itercycle, ….
- Clock application
  - Main Clock Screen
    Dim Screen/AutoDim function
  - Overlay Setup Buttons
  - Set Time Screen
  - Setup Display Screen
  - Save & Restore settings
  - Help/ About Screen

- Start X-Windows - no desktop
- Clock Display : Start, Monitor, restart
- Set ssh, WiFi, TimeZone, PASSWORD
- Set Screen resolution
- Rotate LCD
- Utilise Real Time Clock (RASClock RTC)
- Stop screen/network powersave
- Stop X-Windows screen saver
- Stop cursor from showing

How long did it take?
About 4 months (elapsed - not effort)

Learn Python, libraries, Raspbian & generate first prototype Main Screen (Clock)	2 weeks
Design all screens & interactions	2 hours
Code to completion	6 weeks
Struggle with RTC & eventually replace with RASClock	8 weeks
Configuration changes (wrestle with unix & WIFI)	5 weeks

How much does it cost?

Commercial versions are £80 - £180

- Useful Suppliers
  - Pi-Supply
  - Pimoroni
  - ModMyPi
  - Pi-Hut
  - CPC Farnell
  - (Maplin)
- Look for bundles
- Shop around
- Watch out for delivery charges
  CPC Farnell ship free over £6!
  others over £10, £20, £50…
- Sometimes they are cheaper on Amazon
  even when supplied from the same shop
  (I have Amazon Prime which also helps :)

Display	£55	£55
Pi 3	£30	Pi2 £24
Case	£18	£10
RTC	£9	£9
Power Supply	£6	£6
8GB SD Card	£5	£5
Total:	£123	£109
+ Shipping		

What has been the outcome?

- First night, Elizabeth woke in the night.
- Saw the clock reading “Middle of the night”
- Went back to sleep without worrying

After 4 months?

- Still prefers to ask what day it is :)

What were her next requirements?

- “I want to be able to ask who is coming to visit and hear the reply”

AlexaPi & CalendarTV Projects

- **AlexaPi**: Link headless Pi to Amazon Alexa AI & Google calendar
  - Touch a box - a light comes on - ask a question
  - Ask when nurse is coming, what is happening today
  - Have the light change colour as the answer is being formulated
  - Change light to green and answer the question
  - Update calendar from mobile phone
  - Make it look like furniture - no complex technology

- **CalendarTV**: Display Google calendar on the TV
  - Change display with a remote control

What are they made from?

- AlexaPI
  - Pi 3, Pimoroni Blinkt, Adafruit capacitative touch, speakers, microphone, Mausberry Circuits Safe Shutdown Power Switch, Amazon Alexa Voice Services (JSON interface), python, magnets, wooden box, conductive ink, varnish, hacked mood light globe

AlexaPi cost?

- Useful stores
  - CPC Farnell
  - Habitat (sale)
  - Amazon
  - HobbyCraft
  - Argos
  - B & Q
- BareConductive Paint
- First4Magnets neodymium 1x10x5mm
- Adafruit Capacitative touch board
- Sienoc (mini microphone)
- Trust Milo USB powered speakers
- Dremel, craft chisel & wire saw, sanding blocks/ sheets, white spirit, foam brushes, wood filler, super glue, spacers, velcro

	1 Unit	Purchase
Box	£8	
Conductive Paint	0.50	£24.00
Sticky Tape	£0.10	£1.50
Magnets	£1.00	£4.90
Varnish	£0.20	£6.32
Foam brushes	0	£3.95
Pi 3	£30	
Touch Board	£15.50	
Microphone	£5.38	
Globe (sale)	£1.50	
Speakers	£6.99	
Ground Loop Isolator	£5.99	
Smart Power Switch	£12.50	
2 USB Cables	£8	
Power Supply	£6	
8GB SD Card	£5	
Total:	£106.66	

What is CalendarTV made from?

- Pi 3, HDMI cable, case, OSMC remote control
- Google calendar, utility to force keystrokes
- I may try to use a Pi Zero + WiFi add on board (BugBear)

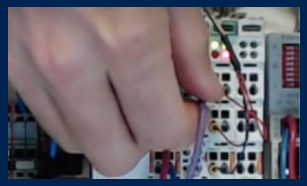
Potential next projects

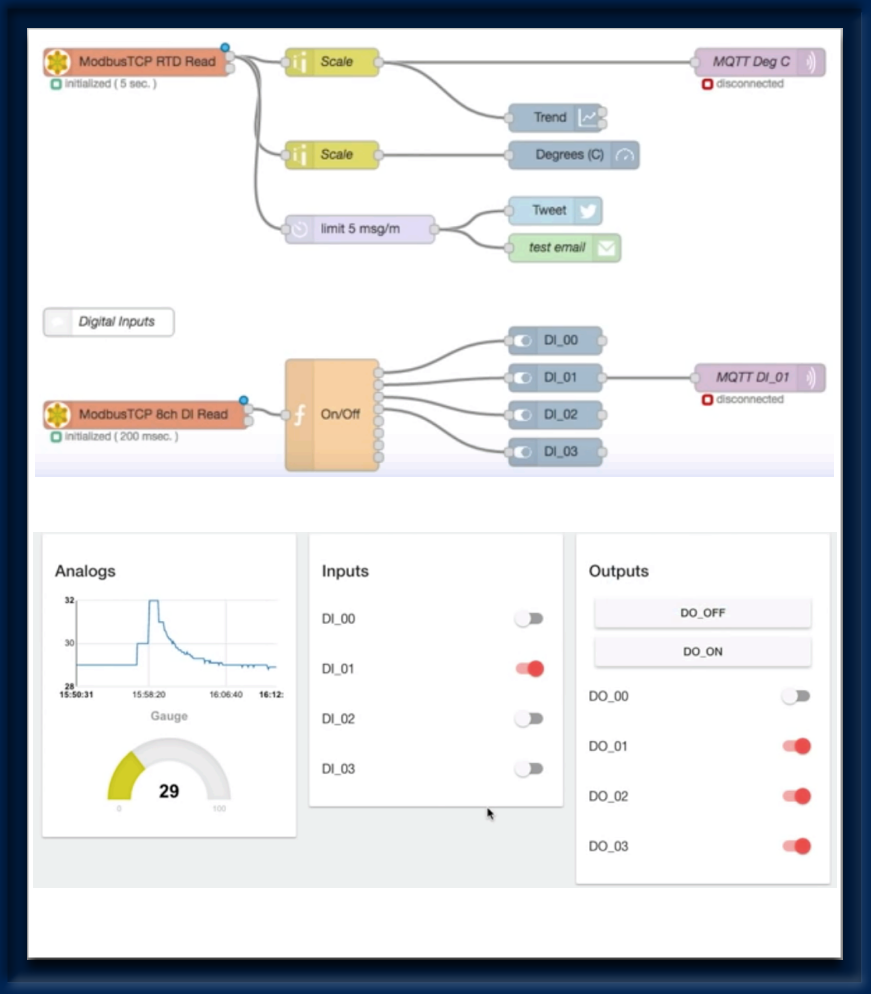
- Link the AlexaPi to the CalendarTV with NodeRed/MQTT
  - Send common commands using the CalendarTV remote control to the AlexaPi
  - Common commands from remote control “What day is it today?”, “What is happening today?”
  - Possibly also apply Alexa Skills to use voice via AlexaPi to control CalendarTV & TimePeace using Node-Red
- An easy to manipulate timeline of personal history& photos in the context of historical events, music, TV, Film

Investigate

- Paho MQTT Mosquito
  - Easy to use
  - Publish & Subscribe
  - Fast status & update sharing

- IBM Node Red
  - Easy to use
  - Part of Raspbian distribution
  - Rapid delivery
  - Graphical orchestration
  - Build status web pages
  - Save data
  - Link systems & coordinate activities





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(note two underscores)

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