

節奏 繞纏

Rhythmic Entanglements

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動作、感測與聆聽的筆記

Notes on Movement, Sensing and Listening

當動作變成聲音： 我們能否聆聽自己，也覺察他人？

When Movement Becomes Sound:
Can We Listen to Ourselves and Notice Others?



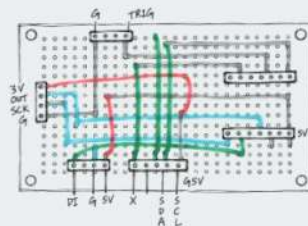
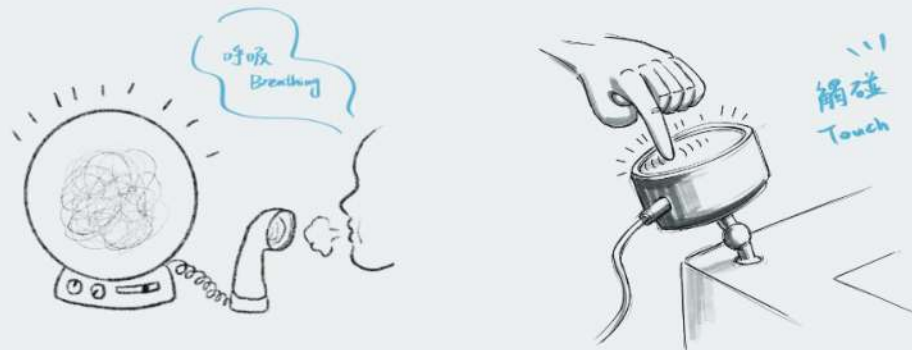
《節奏繞纏》始於「藝術家進駐工研院」，將心率、呼吸與動作等訊號轉為聲音，探索如何從中感受身體的細微變化。除了量測健康數據，我們也關注人如何理解自身狀態，以及個人感受與身體經驗如何參與從資料到聲音的轉譯。

隨著計畫推進，焦點也延伸到共同操作。每個人的出力輕重、動作快慢都有所不同。我們想問：互動系統如何容納這些差異，讓每個人都能以自己的節奏回應？

Rhythmic Entanglements started with the Arts@ITRI program, turning heart rate, breathing and movement into sound to listen for subtle changes in the body. Beyond health data, we are interested in how people make sense of their own bodies and how personal sensations and embodied ways of perceiving can shape the way data becomes sound.

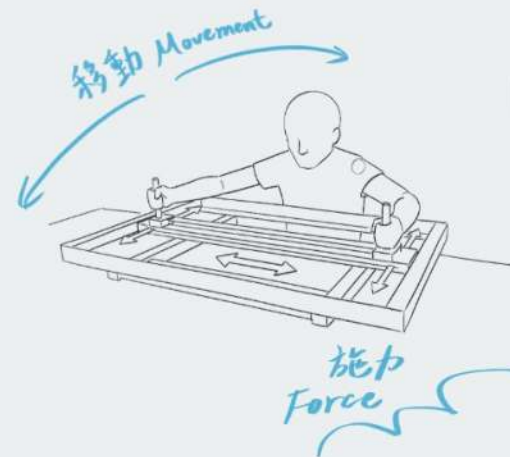
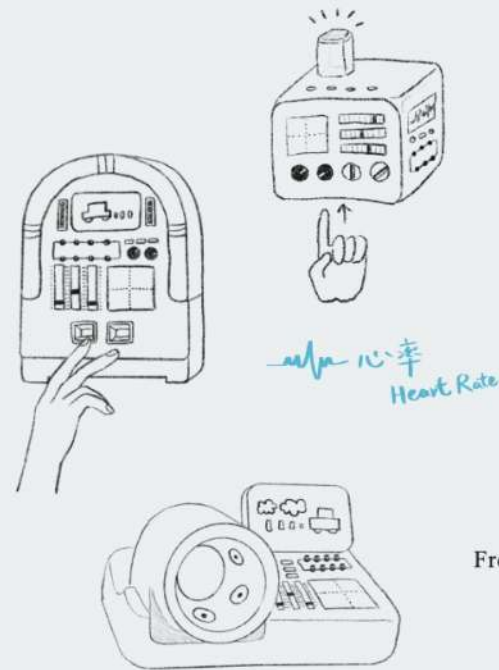
As the project progressed, we explored what happens when people use the system together. People move differently: pressing harder or softer, moving faster or slower. The question became how an interactive system could accommodate these differences and allow everyone to respond in their own rhythm.

感測裝置與
互動方式的概念手稿
Concept sketches of sensing prototypes
and how people interact with them.



感測器能以數值記錄身體動態。例如，距離感測器持續量測遠近，就能判斷移動方向與速度；壓力感測器則感應按壓輕重。計畫發展中，我們也測試了呼吸、脈搏與不同的觸碰方式。這些數值即時對應到聲音，讓不易注意到的起伏變得可感。

當動作改變聲音，聲音又反過來影響下一個動作，身體也在這個回饋循環中成為音樂表達與互動的一部分。這些實作也延伸到動作背後的生活經驗。



Sensors can capture changes in the body as numerical values. A distance sensor, for example, tracks an object's proximity over time, indicating movement direction and speed, while a pressure sensor measures how firmly someone presses. During the project, we also tested ways of sensing breathing, pulse and different forms of touch. These values were mapped to sound in real time, making otherwise unnoticed fluctuations audible.

As movement alters sound, sound in turn shapes the next movement. Within this feedback loop, the body becomes part of musical expression and interaction. These experiments also extend to the everyday experiences behind movement.

從感測身體，到音樂表達

From Sensing the Body to Musical Expression

相似的動作，不同的生命經驗

Similar Gestures, Different Lives



復健與健康促進常從熟悉、可重複的動作開始，例如抓握、捏取、扭轉、推拉。這些動作看似尋常，所需要的力氣、協調與觸覺判斷，卻會隨著年齡、身體狀態與長年累積的習慣而改變。同一個動作由不同的人來做，也會有不同的軌跡。

進駐期間，我們在長者據點的工作坊裡從「手」開始談起。參與者描繪自己的手部輪廓，並從握筆、開瓶蓋等日常動作，談到工作、照顧家人，以及不同生命階段的經驗。相似的手勢從而連向不同的人生片段。

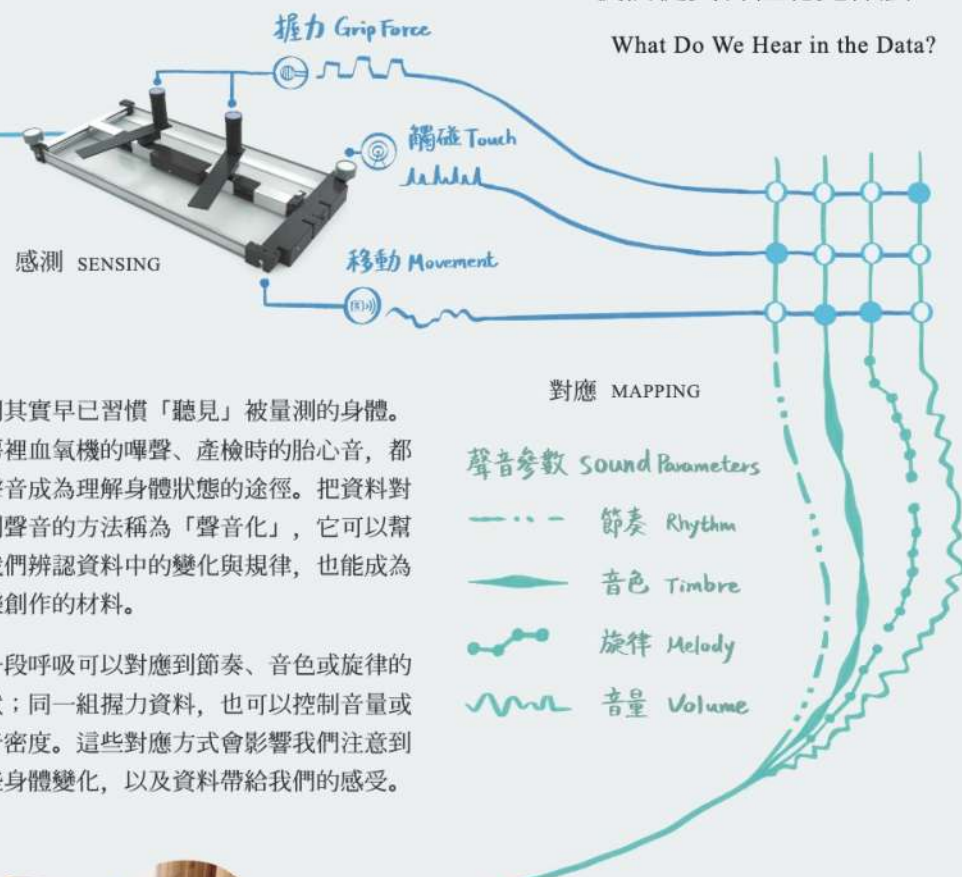
Rehabilitation and health promotion often begin with familiar, repeatable movements, such as gripping, pinching, twisting, pushing and pulling. Although these actions may seem ordinary, the strength, coordination and tactile awareness they require can change with age, physical condition and long-standing habits. The same movement can follow a different path from one person to another.

During the residency, our workshops at a community center for older adults began with the hand. Participants traced their own hands, and everyday actions such as holding a pen or unscrewing a bottle cap prompted conversations about work, caregiving and different stages of life. Similar gestures brought up different moments from their lives.



參與者依聲音調整動作

Participants adjust their movements in response to the sound.



我們其實早已習慣「聽見」被量測的身體。病房裡血氧機的嗶聲、產檢時的胎心音，都讓聲音成為理解身體狀態的途徑。把資料對應到聲音的方法稱為「聲音化」，它可以幫助我們辨認資料中的變化與規律，也能成為音樂創作的材料。

同一段呼吸可以對應到節奏、音色或旋律的起伏；同一組握力資料，也可以控制音量或聲音密度。這些對應方式會影響我們注意到哪些身體變化，以及資料帶給我們的感受。

We are already familiar with hearing the body being measured. The beeping of a pulse oximeter and the fetal heartbeat heard during a prenatal checkup show how sound can help us understand what is happening in the body. Mapping data to sound in this way is called *sonification*. It can help us notice changes and patterns in data and also provide material for music and creative practice.

The same breathing data can shape rhythm, timbre, or the rise and fall of a melody; grip-force data can likewise control volume or sound density. Different mappings can draw attention to particular changes in the body and affect how we experience the data.

從復健裝置到聲音介面

From Rehabilitation Device to Sound Interface

同動車原本是一套上肢復健輔具，兩側握把以鏡像方式連動，讓一側的動作帶動另一側。我們加入握力、移動與觸碰等感測器，將操作時的變化即時對應到聲音，探索這套裝置如何成為音樂表達的介面。

我們也進一步嘗試雙人操作：當兩個人共同使用連動的握把，一方的速度、施力與停頓都會影響另一方。原本為單人復健設計的動作，便成了彼此感知與協調的過程。

The Synchronous Movement Vehicle (Synslai) was developed as an upper-limb rehabilitation device. Its two handgrips are mechanically linked so that movement on one side produces a mirrored movement on the other. We added sensors for grip force, movement and touch, mapping their data to sound in real time to explore how the device could become an interface for musical expression.

We also tested two-person use: when two people share the linked handgrips, one person's speed, force and pauses affect the other. An exercise originally designed for individual rehabilitation becomes a way of sensing and coordinating with each other.



數據之外，
還有什麼無法被測量？

What Remains Beyond Measurement?

從穿戴式裝置到復健輔具，健康科技讓愈來愈多身體狀態可以被量測、記錄與比較。然而，這些數值的意義仍取決於我們的解讀。當「正常／異常」、「進步／退步」被用來描述與評估身體狀態時，也會影響我們如何看待身體及其變化。

聲音能讓資料中的強弱、起伏、停頓與節奏隨時間展開。聲音化或許提供了另一種面對數值的方式，讓人暫緩對身體作出非黑即白的判斷，也為感受與表達留下空間。

Health technologies, from wearable devices to rehabilitation equipment, enable us to measure, record and compare more and more aspects of the body. Yet the numbers do not speak for themselves. Framing measurements in terms of “normal/abnormal” and “improvement/decline” also shapes our understanding of the body.

Sound lets intensity, fluctuations, pauses and rhythm in the data unfold over time. Sonification may offer another way of approaching these numbers, letting us suspend judgment about the body and leaving room for feeling and expression.

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計畫資料與相關實踐

Project Resources and Related Work

畫一張身體地圖 Drawing a Body Map

I love to talk, so my mouth makes the most sound. My hearing isn't as good as it used to be, and that's how I notice my body changing.

愛說話的嘴巴最常發出聲音；漸漸聽不清的耳朵，也讓人察覺身體正在改變。

身體 Body → 感受 Feeling → 記憶 Memory → 故事 Story

In the morning, I practice qigong, pushing my hands forward with each breath in and out. My stomach rumbles a lot too.

