# Coding #01: Signals and Systems 编程 #01：信号与系统

Coding 10 Points Possible 10 分可能

**2025/9/3**

Attempt 1

In Progress 进行中

**NEXT UP: Submit Assignment**

**下一个：提交作业**

Add Comment 添加评论

**Unlimited Attempts Allowed**

**允许无限次尝试**

2025/8/22 to 2025/9/10

**Details 详细信息**

# 🗃️ Case File #1: *The Disappearing Signal*

# 🗃️ 案件档案 #1：消失的信号

## Problem 1: Identifying the Source

## 问题 1：确定信号来源

Agents, we've intercepted a mysterious transmission. The signal is faint, partially buried in time, and seems to carry an unusual phase structure. Headquarters has recovered the recording for you, and you may retrieve it with the command:

特工们，我们截获了一段神秘的传输信号。该信号微弱，部分被时间掩盖，似乎携带了一种不寻常的相位结构。总部已经恢复了这段录音，你可以通过以下命令获取它：

```
[x, fs] = get_recording('########');   % Replace with your UFID
```

The intercepted transmission was generated from one of four possible source types:

截获的传输信号可能来自四种可能的信号源类型之一：

**Type 1** — cosine with exponential rise:

类型 1 — 余弦指数上升：

$$x(t) = A\cos(2\pi f_c t)(1 + e^{+0.5\pi t})u(t)$$

**Type 2** — sine with exponential rise:

类型 2 — 正弦指数上升：

$$x(t) = A\sin(2\pi f_c t)(1 + e^{+0.5\pi t})u(t)$$

**Type 3** — cosine with exponential decay:

类型 3 — 余弦指数衰减：

$$x(t) = A\cos(2\pi f_c t)e^{-9\pi t}u(t)$$

**Type 4** — sine with exponential decay:

类型 4 — 正弦指数衰减：

$$x(t) = A\sin(2\pi f_c t)e^{-9\pi t}u(t)$$

Your mission is to **reverse-engineer the source parameters** from the raw signal:

您的任务是从原始信号中逆向工程出源参数：

- **type** — which of the four possible waveforms was used (1, 2, 3, or 4)

  type — 使用了四种可能波形中的哪一种（1、2、3 或 4）
- **A** — the amplitude. A — 振幅。
- **fc** — the center frequency (Hertz).

  fc — 中心频率（赫兹）。

- **t0** — the time delay (seconds).

  t0 — 时间延迟（秒）。

Once you've decoded the transmission, you must also reconstruct the **response signal** `y`: the same as what you observed, but shifted in phase by **+90 degrees**. You may reconstruct this with or without the time delay.

在你解码了传输信号后，你还必须重建响应信号 `y`：与你观察到的相同，但相位提前了 +90 度。你可以选择是否包含时间延迟来重建此信号。

---

# Required Tools 所需工具

get_recording function: **get_recording.p (https://ufl.instructure.com/courses/540008/files/99432393?wrap=1)** **(https://ufl.instructure.com/courses/540008/files/99432393/download?download_frd=1)**

get_recording 函数：get_recording.p

---

# Submission Instructions 提交说明

Prepare a `.mat` file containing the following variables:

准备一个包含以下变量的 `.mat` 文件：

- `type`
- `A`
- `fc`

- `t0`
- `y`

For uniformity, save your results as:

为保持统一，请将您的结果保存为：

```
save('case1_problem1.mat', 'type', 'A', 'fc', 't0', 'y')
```

Upload this file as your official report to Headquarters. Your accuracy will determine whether we can trace the origin of this mysterious broadcast.

将此文件作为您的正式报告上传至总部。您的准确性将决定我们能否追踪到这个神秘广播的来源。

---

# Problem 2: Probing the Black Box

# 问题 2：探测黑箱

Agents, the intercepted transmission has led us to an unknown device. Its behavior is shrouded in mystery. Headquarters has provided you a way to safely probe the system:

代理，拦截的传输将我们引向了一个未知设备。它的行为充满谜团。总部为您提供了一种安全探测系统的方法：

```
y = probe_system('########', x);   % Replace ######## with your UFID
```

This function allows you to feed an input signal `x` into the black box and observe the corresponding output `y`. Beyond this, nothing

about the system's structure is revealed—you must deduce its nature through careful experimentation.

此功能允许您将输入信号 `x` 输入到黑箱中，并观察相应的输出 `y` 。除此之外，系统结构的任何信息都不会被揭示——您必须通过仔细的实验来推断其特性。

Your mission: determine the fundamental properties of this system. Each property can only take one of two values:

您的任务：确定该系统的根本属性。每个属性只能取两个值中的一个：

- **Linearity (`linear_type`) 线性性（`linear_type`）**
  - `0` → Not linear `0` → 不是线性的
  - `1` → Linear `1` → 线性
- **Time-Invariance (`timeiv_type`) 时不变性 (`timeiv_type`)**
  - `0` → Not time-invariant `0` → 非时不变的
  - `1` → Time-invariant `1` → 时不变
- **Causality (`causal_type`) 因果性 (`causal_type`)**
  - `0` → Not causal (depends on future inputs)
    `0` → 非因果的（依赖于未来的输入）
  - `1` → Causal (depends only on present/past inputs)
    `1` → 因果关系（仅依赖当前/过去输入）
- **Memory (`memoryless_type`) 记忆性 (`memoryless_type`)**
  - `0` → Has memory (output depends on past inputs)
    `0` → 有记忆（输出依赖于过去输入）

- `1` → Memoryless (output depends only on current input)
  `1` → 无记忆（输出仅依赖于当前输入）

---

# Required Tools 所需工具

probe_system function: **probe_system.p (https://ufl.instructure.com/courses/540008/files/99428807?wrap=1)** ⬇ **(https://ufl.instructure.com/courses/540008/files/99428807/download?download_frd=1)**

probe_system 函数：probe_system.p

---

# Submission Instructions 提交说明

Prepare a `.mat` file containing the following variables:

准备一个包含以下变量的 `.mat` 文件：

- `linear_type`
- `timeiv_type`
- `causal_type`
- `memoryless_type`

Save your report in the standard format:

将你的报告保存为标准格式：

```
save('case1_problem2.mat', 'linear_type', 'timeiv_type', 'causal_type', 'memoryless_type')
```

Your success depends on correctly classifying the system's behavior. Probe wisely—each clue in the input-output relationship

may reveal the device's true nature.

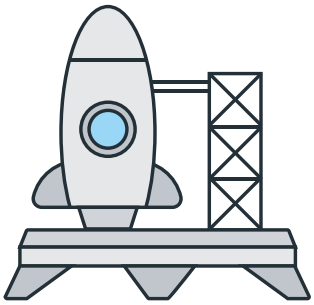
你的成功取决于正确分类系统的行为。要明智地探查——输入输出关系中的每个线索都可能揭示设备的真实本质。

## Choose a submission type 选择提交类型

Upload 上传

Google Drive Google 云端硬盘

More 更多



Choose a file to upload
选择一个文件进行上传

File permitted: MAT 允许的文件：MAT 【仅输出译文，无需其他说明】

or 或

Canvas Files 画布文件

Submit Assignment