R101/R102 演習 2-1

学生番号：242C2016　氏名：奥村直

知的システム工学科システム制御コース

2025 年 5 月 18 日

1 ソースコード

Listing 1.1: digital__pi.m

```
function [vi, desired_rev] = digital_pi(t, omega, get_reference_fn, Kp, Ki)
% Customizable digital PI controller
%
% Inputs:
%   t - Current time [s]
%   omega - Current angular velocity [rad/s]
%   get_reference_fn - Function handle that returns desired revolution [rps]
%   Kp - Proportional gain
%   Ki - Integral gain
%
% Outputs:
%   vi - Calculated input voltage [V]
%   desired_rev - Desired revolution [rps]

    % Get the desired revolution at the current time point
    desired_rev = get_reference_fn(t);

    % Convert desired revolution (rps) to angular velocity (rad/s)
    desired_omega = desired_rev * 2 * pi;

    % Compute control error (rad/s)
    err = desired_omega - omega;

    % Persistent storage for integral computation
    persistent acc_err_storage last_time_storage;
    if isempty(acc_err_storage)
        acc_err_storage = containers.Map('KeyType', 'char', 'ValueType', 'any');
        last_time_storage = containers.Map('KeyType', 'char', 'ValueType', 'any');
    end

    % Create a unique key for each Kp/Ki pair
    key = sprintf('%.5f_%.5f', Kp, Ki);

    % Initialize accumulated error and last time if first call
    if t == 0 || ~isKey(acc_err_storage, key)
        acc_err_storage(key) = 0;
        last_time_storage(key) = t;
    end

    % Time step since last call
    dt = t - last_time_storage(key);
    last_time_storage(key) = t;

    % Update integral term (accumulated error)
    acc_err = acc_err_storage(key) + err * dt;
    acc_err_storage(key) = acc_err;

    % PI control law
    vi = Kp * err + Ki * acc_err;
end
```

2　参考文献・生成 AI

- テキスト（第 1 章まで）
- ChatGPT 4o