

Designing Human-Centered Autonomous Agents

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Outline

- Introduction
- Related research areas
- Designing a Human-Centered Autonomous system
- Requirements that HCA places on software systems
- Existing NASA HCA applications
- Summary

Introduction

- Human-centered automation (HCA)
 - maximizes goals of humans
 - supports full range of interactions
- Want to minimize the necessity for human interaction, but maximize the capability to interact
- Synergism between operators and the autonomous system
- Adjustable autonomy
 - allows autonomous systems to operate with dynamically varying levels of independence, intelligence and control

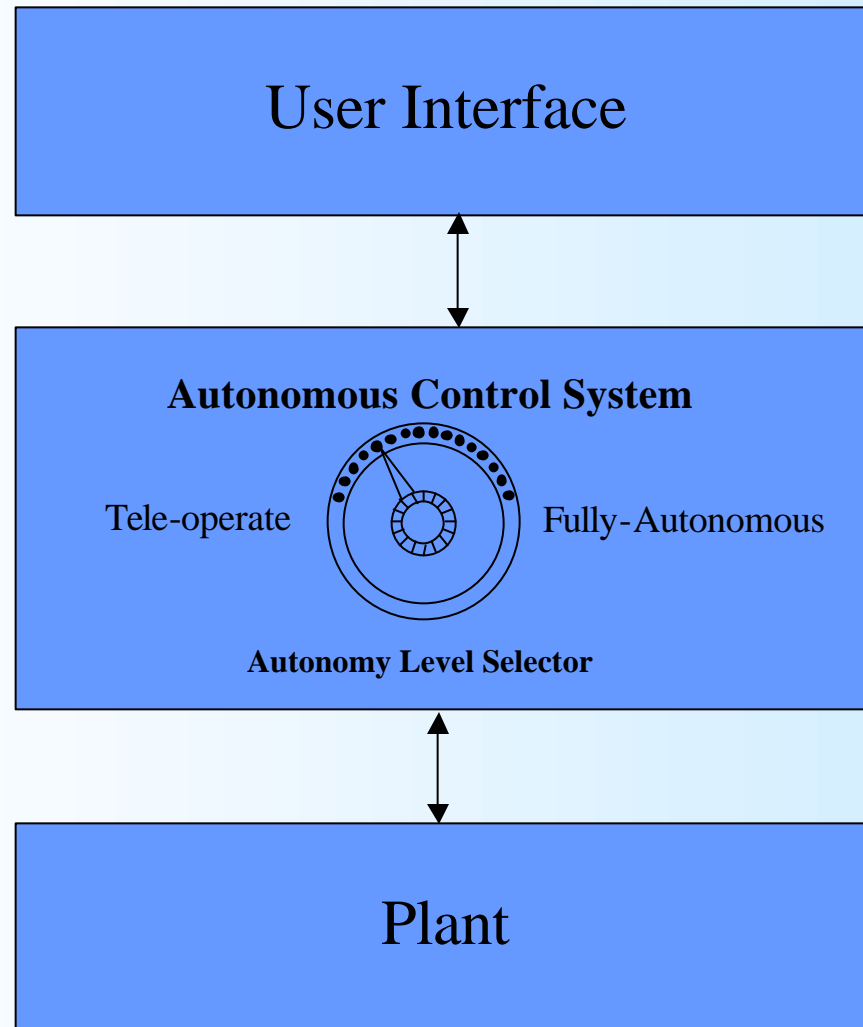
Adjustable Autonomy Systems

A control system that has the ability to:

- be completely in control
- supervise manual control
- be somewhere in between
- shift among these control extremes in a safe and efficient manner

is an *adjustable autonomy* system

Basic HCA Architecture



Adjustable Autonomy

- A system's adjustable autonomy can involve changes in:
 - The complexity of the commands it executes
 - The resources (including time) consumed by its operation
 - The circumstances under which it will either override or allow manual control
 - The circumstances under which it will request user information or control
 - The number of subsystems that are being controlled autonomously

Motivations

- Complexity of commands
- Uncertainty/changing environment
- Safety/monitoring/politics
- Maintenance or calibration
- Training
- Flexibility
- Resource allocation

Benefits

- Partial autonomy where full autonomy not possible or desired
- Lower cost
 - difficult-to-automate parts of the system can be left for humans
- Safety and reliability
 - human experience brought to bear when needed
- Operator acceptance of autonomous systems