

Characterizing Process Variation

Borislava I. Simidchieva and Leon J. Osterweil

Laboratory for Advanced Software Engineering Research
Department of Computer Science
University of Massachusetts Amherst
Amherst, MA 01003, USA



Introduction

twitter: @simidchieva

email: bis@cs.umass.edu

web: <http://www.cs.umass.edu/~bis/>

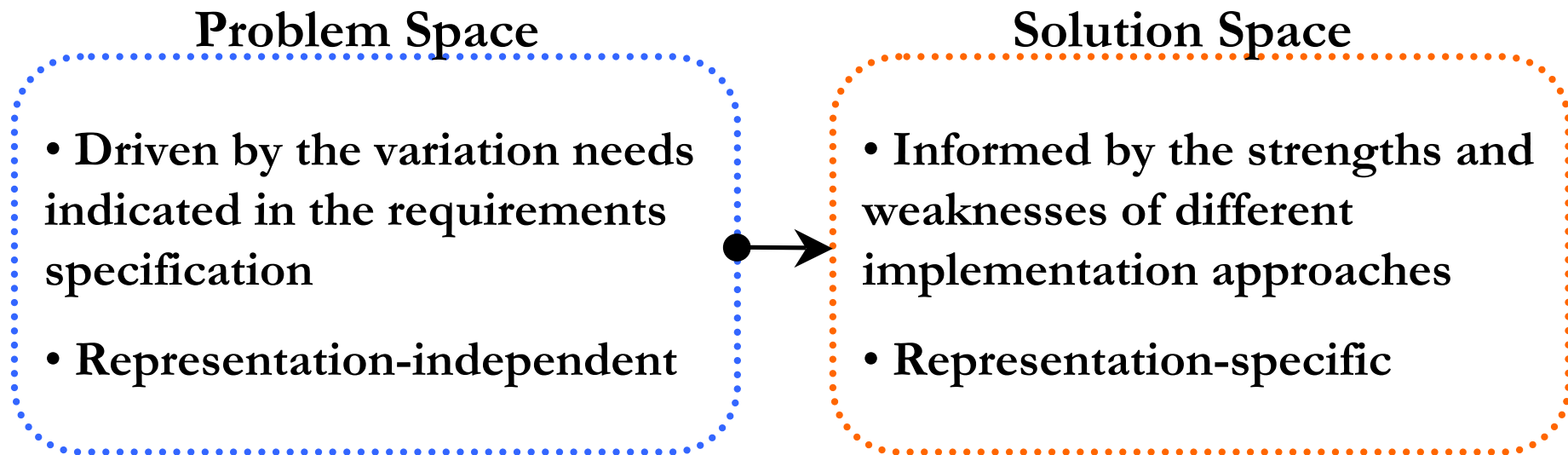
- A process model defines the coordination of agents performing activities using resources and artifacts
- Careful study of the model can help to identify improvements to the real-world process it reflects
- Complex real-world processes exhibit variation
- Such processes may be accommodated better by a family of process models

Approach

twitter: @simidchieva
email: bis@cs.umass.edu

web: <http://www.cs.umass.edu/~bis/>

- Formally characterize different variation relations
- Reason at two different levels of abstraction
- Strive for improved *generation*, *analysis*, and *navigation*



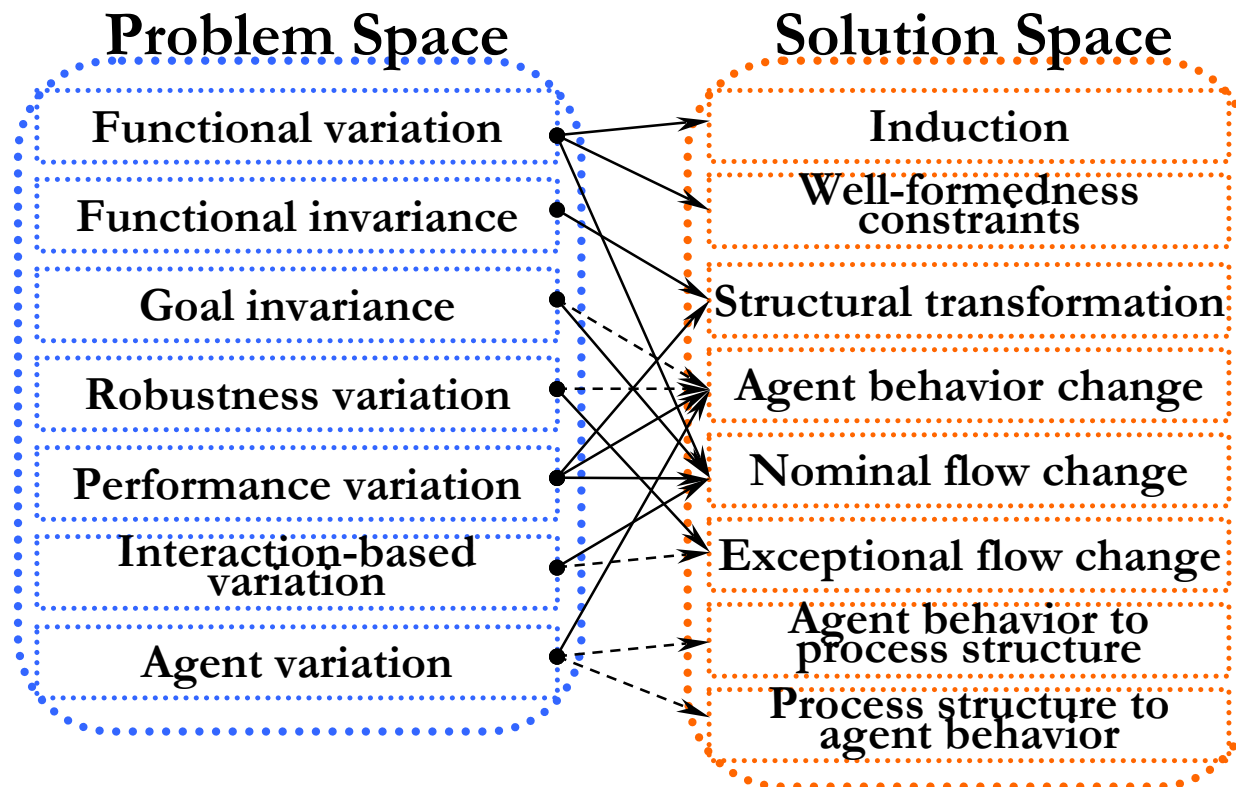
Approach

twitter: @simidchieva

email: bis@cs.umass.edu

web: <http://www.cs.umass.edu/~bis/>

- Formally characterize different variation relations
- Reason at two different levels of abstraction
- Strive for improved *generation*, *analysis*, and *navigation*



Explicit modeling of process variation may help with:

- 1. Generation** of new variants
 - Creating a new variant based on pre-specified variation relations and known requirements and architecture specifications
- 2. Analysis** of an entire process family at once
 - Reasoning about all variants collectively to determine if they meet certain properties in dimensions such as security, privacy, safety and correctness
- 3. Navigation** among interrelated software families
 - Identifying which pre-existing variant is most appropriate to use in specific circumstances through navigation through possibly multiple families

Explicit modeling of process variation may help with:

1. Generation of new variants

- Creating a new variant based on pre-specified variation relations and known requirements and architecture specifications

2. Analysis of an entire process family at once

- Reasoning about all variants collectively to determine if they meet certain properties in dimensions such as security, privacy, safety and correctness

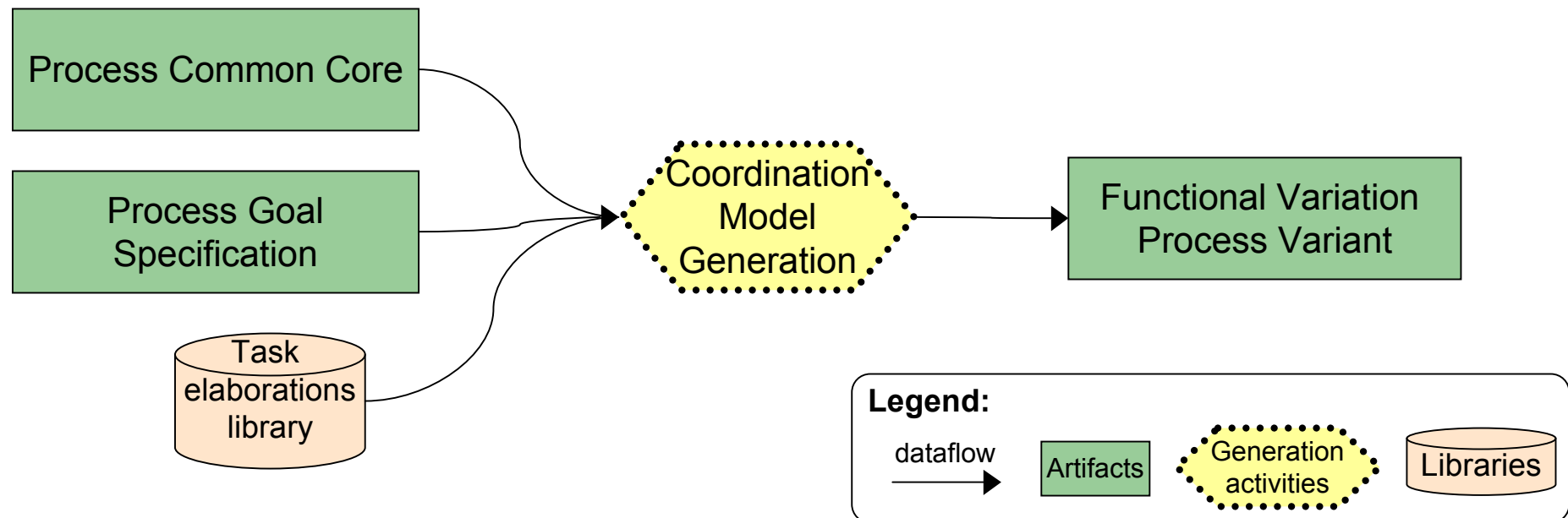
3. Navigation among interrelated software families

- Identifying which pre-existing variant is most appropriate to use in specific circumstances through navigation through possibly multiple families

Explicit modeling of process variation may help with:

1. **Generation** of new variants

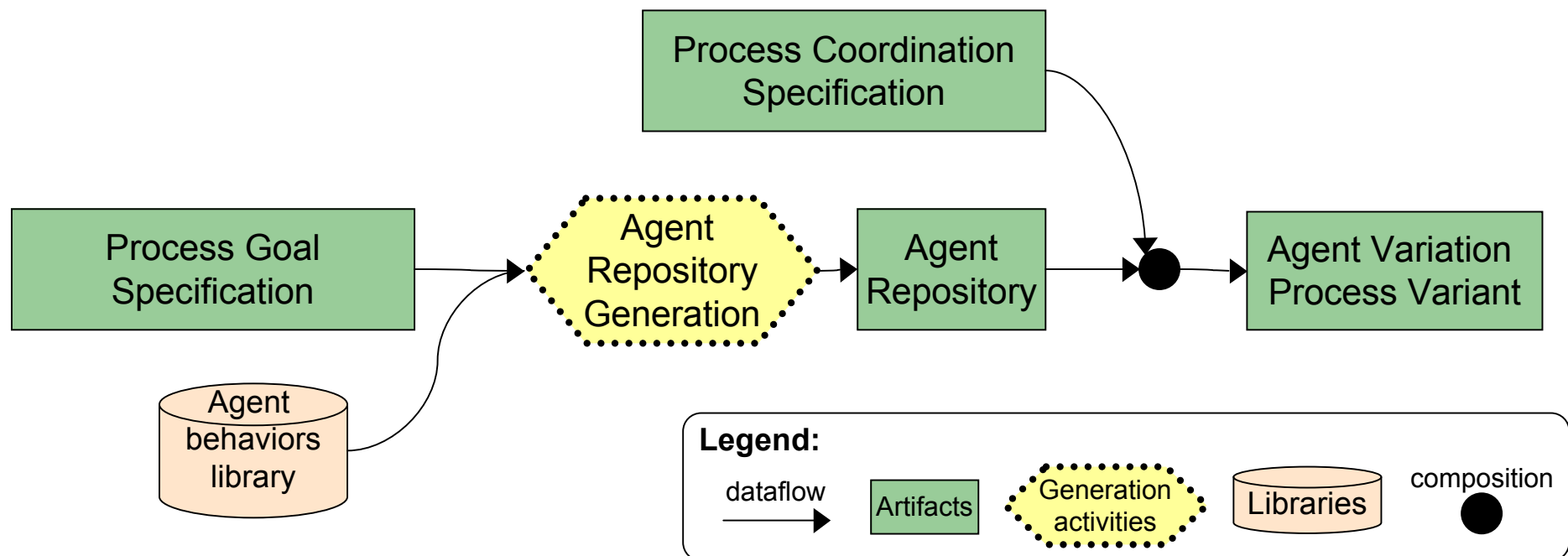
- Creating a new variant based on pre-specified variation relations and known requirements and architecture specifications



Explicit modeling of process variation may help with:

1. **Generation** of new variants

- Creating a new variant based on pre-specified variation relations and known requirements and architecture specifications



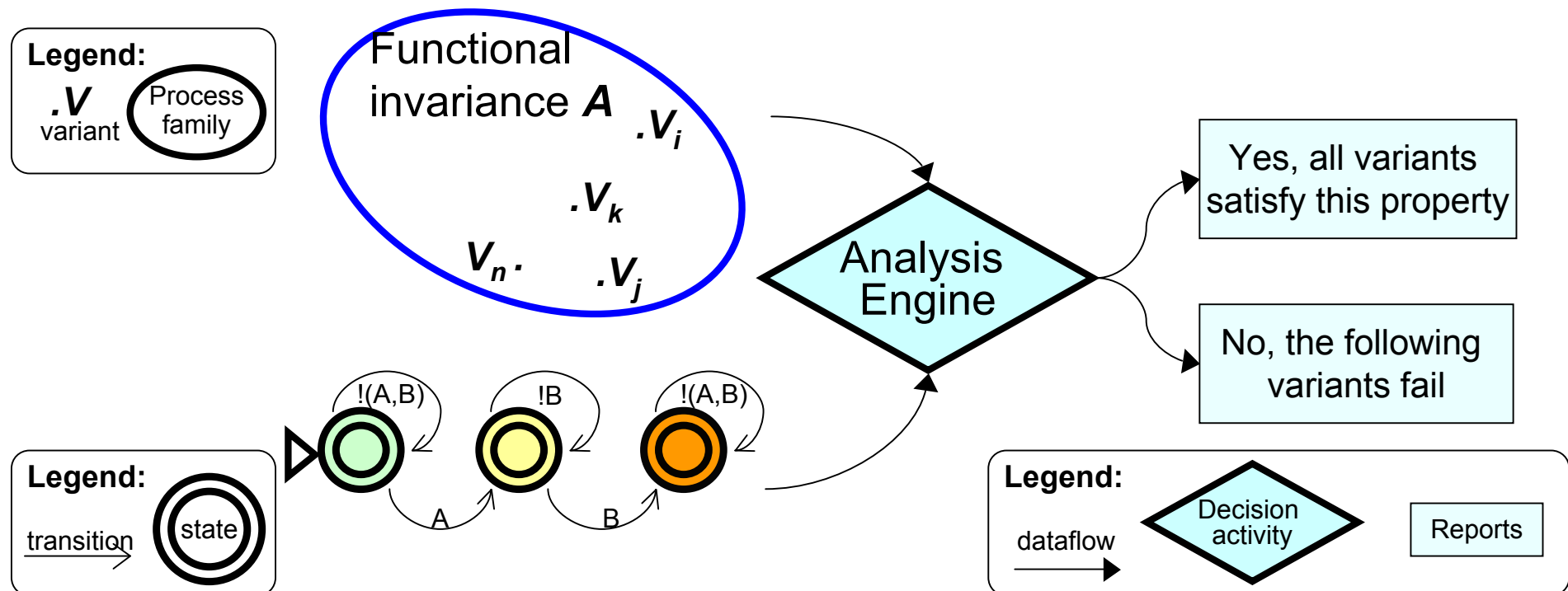
Explicit modeling of process variation may help with:

1. **Generation** of new variants
 - Creating a new variant based on pre-specified variation relations and known requirements and architecture specifications
2. **Analysis** of an entire process family at once
 - Reasoning about all variants collectively to determine if they meet certain properties in dimensions such as security, privacy, safety and correctness
3. **Navigation** among interrelated software families
 - Identifying which pre-existing variant is most appropriate to use in specific circumstances through navigation through possibly multiple families

Explicit modeling of process variation may help with:

2. **Analysis** of an entire process family at once

- Reasoning about all variants collectively to prove safety and correctness properties



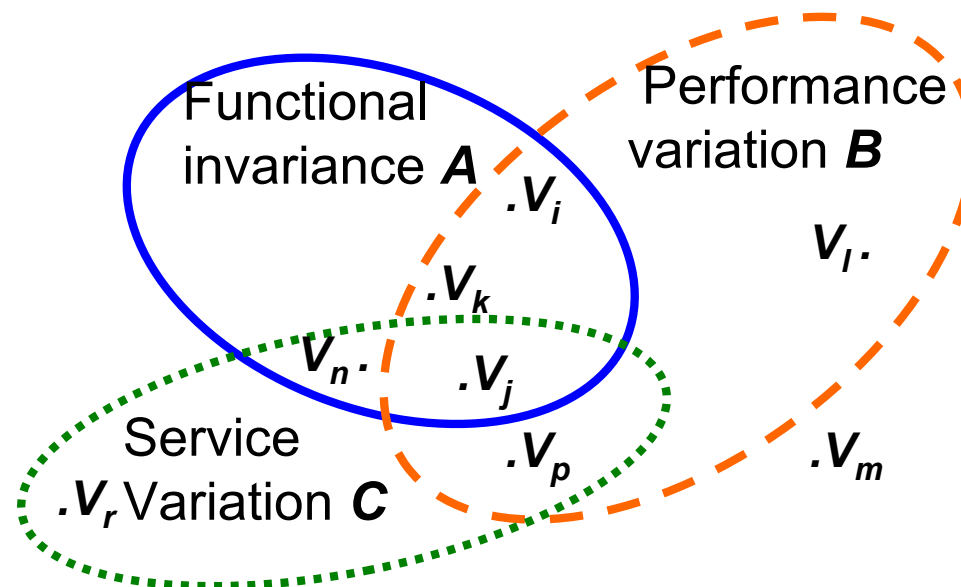
Explicit modeling of process variation may help with:

1. **Generation** of new variants
 - Creating a new variant based on pre-specified variation relations and known requirements and architecture specifications
2. **Analysis** of an entire process family at once
 - Reasoning about all variants collectively to determine if they meet certain properties in dimensions such as security, privacy, safety and correctness
3. **Navigation** among interrelated software families
 - Identifying which pre-existing variant is most appropriate to use in specific circumstances through navigation through possibly multiple families

Explicit modeling of process variation may help with:

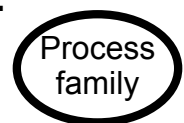
3. **Navigation** among interrelated software families

- Identifying which pre-existing variant is most appropriate to use in specific circumstances through navigation through possibly multiple families



Legend:

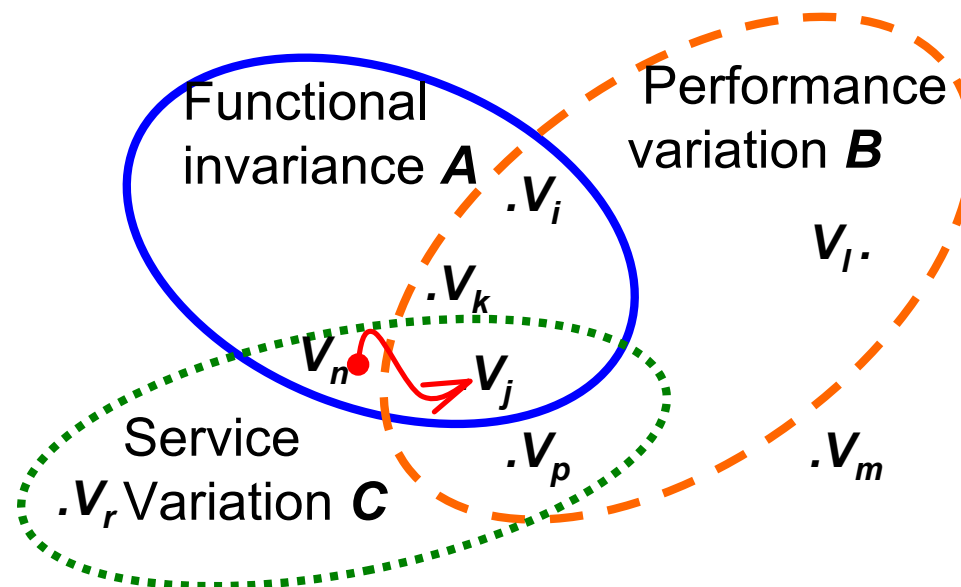
$.V$
variant



Explicit modeling of process variation may help with:

3. **Navigation** among interrelated software families

- Identifying which pre-existing variant is most appropriate to use in specific circumstances through navigation through possibly multiple families



Legend:

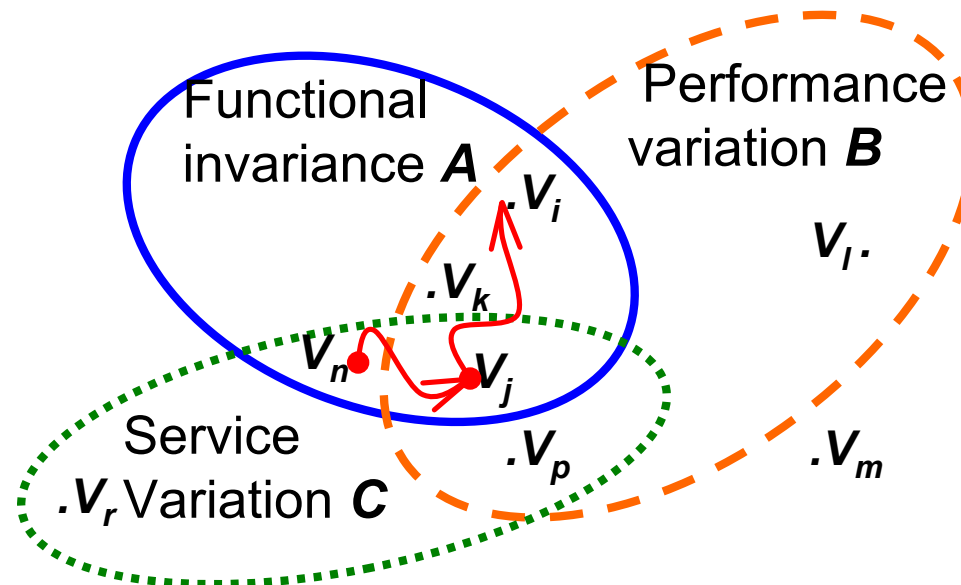
$.V$
variant

Process
family

Explicit modeling of process variation may help with:

3. **Navigation** among interrelated software families

- Identifying which pre-existing variant is most appropriate to use in specific circumstances through navigation through possibly multiple families



Legend:

V
variant

Process
family

Future Work

twitter: @simidchieva

email: bis@cs.umass.edu

web: <http://www.cs.umass.edu/~bis/>

- How is variation rigorously and precisely defined?
- Do these dimensions afford for observed variation?
- How can families based on different variation relations be composed together safely?
- How would composition and intersection affect reasoning?
- How does process variation differ from product variation?
- What kind of tool support would make such a conceptual framework useful?

Conclusion

twitter: @simidchieva

email: bis@cs.umass.edu

web: <http://www.cs.umass.edu/~bis/>

- Variation is inherent in real-world systems
- Being precise about different variation needs can lead to a taxonomy of different variation dimensions
- A disciplined way to model variation explicitly has the benefits of improved generation, analysis, navigation