



ALBERT-LUDWIGS-  
UNIVERSITÄT FREIBURG

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Different rooms

## Tutorials for Verification Exercise sheet 6

### Exercise 1: Closure of Büchi-Automata

Given two total DBAs  $\mathcal{A}_1$  and  $\mathcal{A}_2$ , construct a total DBA that recognizes  $\mathcal{L}(\mathcal{A}_1) \cup \mathcal{L}(\mathcal{A}_2)$ .  
*Hint:* Product automaton as for intersection, but with different final states.

**Exercise 2: Negation of  $\omega$ -regular expressions**  
(omitted)

**Exercise 3: Checking  $\omega$ -regular properties**  
(omitted)

### Exercise 4\*: The combinatorial argument

- (a) Let  $G$  be a complete graph with a countably infinite set of vertices  $V$  whose edges are colored with  $n$  colors. Prove that there is an infinite path such that all its edges have the same color. *Hint:* Induction over number of colors  $n$ . And order the nodes  $V = \{v_0, v_1, v_2, \dots\}$ .
- (b)\*\* *Ramsey's theorem:* Show that every infinite complete graph whose edges are colored with a finite number of colors has an infinite complete subgraph whose all edges have the same color.