## TestFourBarLinkage27Cases + check\_motion\_case(T1: float, T2: float, T3: float, T1T2: float, T1T3: float, expected\_input: str, expected\_output: str): void + test\_case\_1(): void + test\_case\_2(): void + test\_case\_3(): void + test\_case\_4(): void + test\_case\_5(): void + test\_case\_6(): void + test\_case\_7(): void + test\_case\_8(): void + test\_case\_9(): void + test case 10(): void + test\_case\_11(): void + test\_case\_12(): void + test\_case\_13(): void + test\_case\_14(): void + test\_case\_15(): void + test\_case\_16(): void + test case 17(): void + test case 18(): void + test\_case\_19(): void + test\_case\_20(): void + test\_case\_21(): void + test\_case\_22(): void + test\_case\_23(): void + test\_case\_24(): void + test\_case\_25(): void + test case 26(): void + test\_case\_27(): void

## FourBarLinkage

- + Linkage\_Type: str + geometric\_Validity: bool
- + Input\_Link\_Type: str
- + Output\_Link\_Type: str
- + AB: float
- + BC: float + CD: float
- + CD: float + DA: float
- + alpha: float
- + beta: float
- + theta: float + alpha rad: floa
- + alpha\_rad: float
- + beta\_rad: float
- + theta\_rad: float + alpha\_lims: list
- + alpha\_rad\_lims: list
- + alpha\_limited: bool
- + beta\_lims: list
- + beta\_rad\_lims: list
- + coupler\_position: float
- + coupler\_offset: float
- + A: np.array + B: np.array
- + C: np.array
- + C1: np.array
- + C2: np.array
- + C\_last: np.array + D: np.array
- + P: np.array
- + P1: np.array + P2: np.array
- + T1: float
- + T2: float
- + T3: float + L: float
- + t: float
- + alpha\_velocity: float
- + C\_mode: str + switch\_C2\_C1\_180: bool
- + switch\_C2\_C1\_360: bool
- + C2\_C1\_switched\_last\_time: bool
- \_\_init\_\_(AB: float, BC: float, CD: float, DA: float, alpha: float, theta: float, coupler\_position: float, coupler\_offset: float, timeinterval: float, alpha\_velocity:
  - float): void
  - + run(): void + check\_Parameter(): void
  - + find\_Linkage\_Type(): void + calculate\_Classification\_Value(): void
  - + calculate\_Edge\_Value(): void
  - + calculate\_alpha\_lims(): void
  - + calculate\_beta\_lims(): void + calculate\_beta(): void
  - + calculate\_Point\_Position(): void
  - + calculate\_C\_Position(): void
  - + calculate\_P\_Position(): void
  - + animation\_alpha(): void + switch\_C2\_C1(): void

- TestFourBarLinkageCases
- + linkage: FourBarLinkage
- + setUp(): void
- + test\_crank\_rocker(): void
- + test\_double\_crank(): void + test\_double\_rocker(): void
- + test\_rocker\_crank(): void

## GUI

- + linkage: FourBarLinkage
  - + tk: Tk
  - + width: int
  - + height: int
- + model\_frame: Frame
- + model\_animation: Canvas + toolbar frame: Frame
  - + trace\_C: bool
- + trace\_D: bool
- + trace\_P: bool
- + positions\_C: list
- + positions\_D: list + positions\_P: list
- + input\_text: Text
- + input\_classification\_values: IntVar + input\_classification\_values\_button: Checkbutton
  - + reset\_button: Button
  - + slider\_a: Scale
  - + slider\_g: Scale
  - + slider\_b: Scale + slider\_h: Scale
  - + slider\_n: Scale
  - + slider\_T1: Scale
  - + slider\_T2: Scale
  - + slider\_T3: Scale
  - + slider\_L: Scale + slider\_p\_pos: Scale
  - + slider\_p\_off: Scale
  - + slider\_alpha: Scale
  - + slider\_theta: Scale + enable\_animation: IntVar
  - + animation\_button: Checkbutton
  - + trace\_C\_button: Checkbutton + trace D button: Checkbutton
  - + trace\_P\_button: Checkbutton
  - + text\_classification\_values: Text
  - + text\_bars\_values: Text + text\_information: Text
  - + \_\_init\_\_(): void
  - + display\_toolbar(): void
  - + initiate\_linkage\_display(): void+ update\_alpha\_slider(): void
  - + init\_display\_classification\_values(): void
  - + display\_classification\_values(): void
  - + init\_display\_bars\_values(): void
    + display\_bars\_values(): void
  - + display\_bars\_values(): void + init\_display\_information(): void
  - + display\_information(): void
  - + scaling\_factor(): float
  - + calculate\_normalities(): tuple + update\_parameter\_a(val): void
  - + update\_parameter\_g(val): void
  - + update\_parameter\_b(val): void+ update\_parameter\_h(val): void
- + update\_parameter\_p\_pos(val): void
- + update\_parameter\_p\_off(val): void
- + update\_parameter\_alpha(val): void
- + update\_parameter\_theta(val): void+ update\_parameter\_T1(val): void
- + update\_parameter\_T2(val): void
- + update\_parameter\_T3(val): void + update\_parameter\_L(val): void
  - + refresh(): void + reset(): void
- + reset\_bars\_sliders(): void
- + reset\_classifications\_sliders(): void + input classification(): void
- + hide\_classification\_sliders(): void
- + show\_classification\_sliders(): void + hide\_bars\_sliders(): void
- + show\_bars\_sliders(): void
- + hide\_classification\_values(): void+ show classification values(): void
- + hide\_bars\_values(): void
- + show\_bars\_values(): void
- + animation(): void + run animation(): void
- + trace\_C(): void + trace D(): void
- + trace\_P(): void
- + delete\_tracing(): void + hide\_linkage(): void
- + show\_linkage(): void
- + update\_linkage\_display(): void